

Economic Evaluation of Assistive Technology Information

An Australian Perspective

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Contents

1. Setting the scene.....	3
1.1. Prevalence of in-scope populations.....	3
1.2. Types and classifications of AT.....	5
1.3. Statement of the problem	6
1.4. Aims and methods of this analysis.....	8
2. Characteristics of AT information provision	8
2.1. Literature review and international findings	8
2.2. Consumer choice and the need for empathy	10
2.3. Roles of skilled professionals, peers, client reviews, suppliers and impartial brokers.....	10
2.4. Voucher options.....	10
2.5. Loans and hiring options	11
2.6. Databases, AI and algorithms	11
3. Options for comparison	12
3.1. Description of the ATA model.....	12
3.2. Description of an alternative model	13
4. Criteria for comparisons	16
4.1. Effectiveness	16
4.2. Efficiency	17
4.3. Equity	18
4.4. Using the criteria to evaluate the options	18
5. Evaluation of options using criteria	20
5.1. EEE Harvey balls of ATA and KPI calculations	20
5.2. EEE Harvey balls of Alternative model.....	22
5.3. Comparison and recommendations.....	25
6. Conclusions and References	25
Appendix 1: ATA database categories	30
Appendix 2: ATA data analysis.....	31

1. Setting the scene

This report aims to develop a framework for evaluating the benefits and costs of different models for providing information about assistive technology (AT) to consumers and to evaluate the effectiveness, efficiency and equity of several different models for providing information about AT with particular emphasis on different information brokerage. It follows and draws on a scoping review, *Information asymmetry and assistive technology: the role of brokerage services* (D'Cunha et al 2021), completed as the first phase of this project. The work was commissioned by Assistive Technology Australia (ATA) as independent research. The views and conclusions drawn in the report are independent of the funder or any other agency.

1.1. Prevalence of in-scope populations

The Productivity Commission (PC) (Productivity Commission 2011) in its considerations of a National Disability Long-term Care and Support Scheme considered that a National Disability Insurance Scheme (NDIS) should aim to achieve better outcomes for three different groups of people which they described as Tiers:

- **Tier 1 (22.5 million)¹: Every Australian (including those 65 and over).** The PC said ‘the NDIS is for all Australians, since it would provide insurance against the cost of support in the event that they, or a family member, acquire a significant disability’. Costs include products and services (including AT). The PC also saw that the broader community including not-for-profit (NFP) organisations, providers as well as the National Disability Insurance Agency (NDIA) are involved in enabling opportunities, data, research, awareness and inclusivity initiatives for those with or affected by disability.
- **Tier 2 (4 million people with disability and 800,000 of their primary carers)²:** People with, or affected by disability, may receive some funding (not from the NDIS) but “*could approach the NDIS for information and referral services*”, such as information about the most effective support options, with a view also to efficiency. The PC describes the information, products and services sector as a “maze”.³ The Tier 2 population was expected by the PC in 2011 “*to be very high, but the overall costs would not be large*”. However, costs for much AT may be prohibitive for Tier 2 people; information and access are also not uniform.
- **Tier 3 (410,000): People with disability with significant care and support needs for whom NDIS-funded, individualised supports would be appropriate and who were not catered for by other systems.** The PC said that that the NDIA should targeting those in Tier 3 “with ongoing support needs that would otherwise not be reasonably met without taxpayer-funded services”. The extent of the funded support would depend on assessment criteria, the nature and level of

¹ P. 176 Productivity Commission 2011

² P. 176 Productivity Commission 2011

³ The prognosis from the PC for Tier 2, especially disadvantaged subgroups, is that “information and referral services and broader support are likely to be of great value to people with disabilities, their families and carers.” However the PC also notes that: “Many families and individuals have an ability to bear and finance some risks themselves, and this is often a more efficient and flexible way of addressing smaller and more common risks than formal risk pooling through insurance.”

Economic evaluation of Assistive Technology in Australia

support needs, and the individual budget required to fund those supports. “This tier would account for the majority of scheme costs.”

As the NDIS was developed there was a shift from the original recommendations of the Productivity Commission. The focus in the Tier 2 population moved to those under 65 years. Then Tier 2 was renamed as ‘Information, linkages and capacity building’. Much of the funding for Information, linkages and capacity building had traditionally been by the States and Territories, but under the new national disability agreements most of the responsibility, including the funding, was transferred to the Commonwealth – with the NDIA initially being given responsibility for this area as envisaged by the PC. Then in 2020 the responsibility for ILC was transferred from the NDIA to the Department of Social Services.

It is perhaps only natural that as a program develops, it becomes more focussed on meeting the needs of those in greatest need and who are not seen as the responsibility of other programs. However this narrowing of scope introduces significant equity issues and means that solutions that might meet the needs of multiple groups are ignored in favour of solutions that are narrowly focussed on the target population.

The World Health Organisation, in its International Classification of Functioning, Disability and Health (ICF), adopts a much broader conceptualisation of disability. The details of this definition are set out elsewhere⁴, but in short, disability is defined as any outcome of interactions between health conditions and contextual factors such as environmental factors and personal factors which results in impairment, activity limitation and/or participation restrictions.

This definition encompasses short term as well as long term disability making it broader than the definition used by the Australian Bureau of Statistics (ABS) in the Survey of Disability Ageing and Carers (SDAC). Persons with short term disability are very likely to benefit from assistive technology– but their inclusion is beyond the scope of our report which for practical reasons draws on the SDAC and thus on the ABS definition of disability as any limitation, restriction or impairment that has lasted or is likely to last for at least six months.

Drawing on the most recent SDAC data, we have defined three groups who might benefit from information about AT:

Group 1. People with profound or severe core activity limitation (1.41 million people in 2018)

Group 2. People with disability but who do not have profound or severe activity restriction (2.95 million people in 2018)

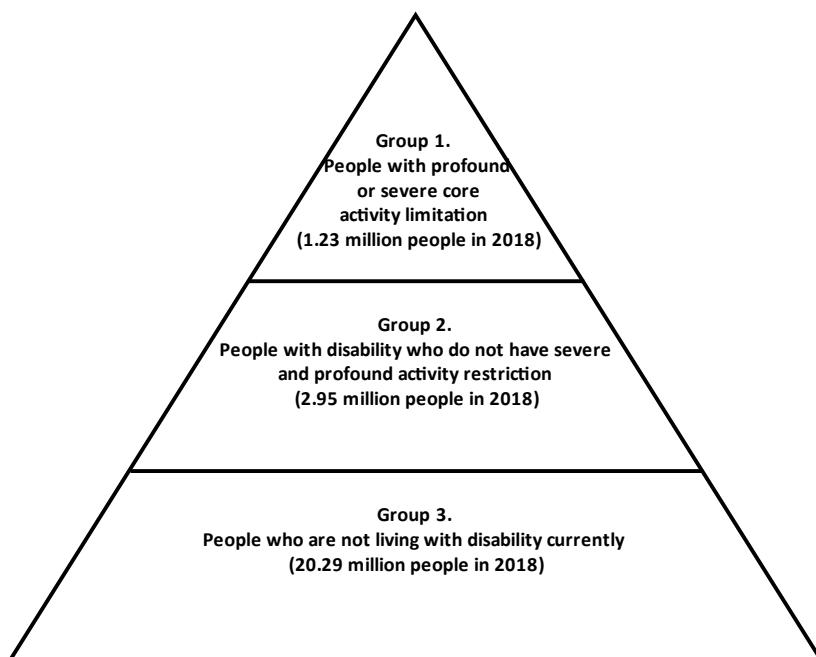
Group 3. People who are not living with disability currently (20.29 million people in 2018).

In 2018 there were 1.41 million people living with profound or severe core activity restriction (Group 1) and another 2.95 million people living with disability (Group 2). In combination Groups 1 and 2 comprise 4.37 million people or 18% of the Australian population. All of these people may benefit from AT and information about AT. These two Groups are the focus of this report as they represent the population with varying degrees of disability who are likely to **need** information about AT. However, as technology expands its role in our lives and the line between technology and assistive technology blurs, many people in Group 3 will also be accessing and using some of the same technology as those in Groups 1 and 2. It must be kept in mind that there are ways to meet the needs of Groups 1 and 2 which also

⁴ See WHO 2011

Economic evaluation of Assistive Technology in Australia

provide benefits to Group 3, and because Group 3 is a much larger population even small benefits per person lead to large overall benefits. And because of economies of scale with information systems, the costs of providing these benefits to Group 3 are small.



Among people with disability, needs for assistance vary widely, as do the types of support and the sources of support. There is no specific data on the unmet need for assistive technology, but we do know the proportion of people with unmet needs for assistance is quite high. For example, among people with profound or severe core activity restrictions living in the community, 8% have an unmet or only partially met need for assistance with self-care, 14% have an unmet or only partly met need for assistance with mobility and 8% have an unmet or partly met need for assistance with communication.⁵

For many of these people, assistive technology has the potential to help bridge the gap.

1.2. Types and classifications of AT

The WHO states that assistive technology is an umbrella term covering the systems and services related to the delivery of assistive products and services. Assistive products maintain or improve an individual's functioning and independence, thereby promoting their well-being.

For this report we adopt the definition of AT used in a recent economic analysis by AHA (2020) as:

⁵ Table 12.1 Australian Bureau of Statistics (2019)

Economic evaluation of Assistive Technology in Australia

Any product (including devices, equipment, instruments and software), especially produced or generally available, used by or for persons with disability for participation, to protect, support, train, measure or substitute for body functions/structures and activities, or to prevent impairments, activity limitations or participation restrictions.

However, because this report is focussing on the information provision aspects of access to AT, the report as a whole fits within the broader AT definition of the WHO which is ‘the systems and services related to the delivery of assistive products and services’. The World Health Organization (WHO 2018) notes that around one in every 10 people in need have access to AT (WHO 2018).

The AHA report categorises types of AT as:

- **Low-risk AT:** Simple and relatively low-cost daily living aids such as a long-handled duster or a jar opener. Low-risk AT is usually available ‘off the shelf’ and needs no clinical input to use. Low-risk AT is defined as having a low potential for causing harm when used for activities in daily living environments (based on a 2020 Therapeutic Goods Administration draft Determination⁶).
- **Under-advice AT:** Products that are generally available but would benefit from written or professional advice to ensure that they are used or installed correctly. Examples include bodysystem monitors, wheeled walking frames and personal alarms.
- **Prescribed AT:** More complex and often more costly technology that is adjusted or configured precisely to meet individual support needs. Examples include scooters, powered wheelchairs, patient hoists, and adjustable beds.

For the purposes of this report, the above categorisation is adopted.

1.3. Statement of the problem

Every economic question is about optimisation. In choosing what AT to buy, the consumer has to decide the optimal amount of time and money to devote to the purchase decision (the “search costs”) as well as the amount of money to actually buy it. Search costs may be a considerable portion of the cost of the purchase and, since people do not have an infinite amount of time and money, they must ration their search costs in selecting a particular AT item, to maximise their wellbeing. Devoting a large amount of time to search for the absolutely best possible AT will provide benefits, but the extra benefit may not be worth the cost of searching for it. Too little investment in the purchase decision will also be suboptimal. Hence the consumer seeks the lowest cost, highest quality information about AT tailored to their needs. Lower cost information reduces search costs, and an advantage of modern technology is that it can provide, through web searches and access to various databases, access to information at a very low cost. One downside, however, is that a huge amount of information is available and much of it is low quality. Thus the consumer benefits if information is filtered to focus on that information which is of high quality and which they can trust, as this saves them time and effort. If web-based resources add markers of quality such as expert assessment or consumer feedback, this markedly increases the value of the database, but this improvement in quality comes at a cost.

⁶ The TGA regulates some but by no means all AT (AHA 2020).

Economic evaluation of Assistive Technology in Australia

Governments may choose to subsidise information about AT as well as its purchase, but in addition to wanting to maximise benefits for consumers, there is a need to distribute the subsidy benefits equitably. Frequently there is a trade-off between equity and efficiency, so the most efficient subsidy may potentially provide more benefits to one group than another – e.g. to people in different areas, of different ethnicities or with varying socioeconomic status. Government subsidies also add extra transaction costs, since there are costs in raising taxes to fund subsidies and transaction costs for the consumer in accessing the benefits (e.g. through an application and assessment process which means test the benefits). Thus any government subsidy must improve efficiency and equity more than the cost of the taxes to fund it, and the extra transaction costs for consumers⁷.

A fundamental problem with providing and accessing AT in Australia is **information asymmetry**, which can occur even in subsidised settings. There are also other **access barriers and quality of services barriers**. These core issues can result in people not purchasing AT effectively, efficiently or equitably, of obtaining equipment that is sub-optimal to needs and/or **abandonment of the AT** that was acquired.

Information asymmetry is when one party (in this case a person with disability or their family/carer needing AT) has less information than the other party they need to deal with (in this case those providing information or access to AT). One party's access to more relevant and up-to-date information can result in potential exploitation, the provision of inappropriate AT, not acquiring AT due to confusion or being overwhelmed, or abandonment of AT – with thus wastage of time, resources and equipment.

Access and quality of service barriers exist because people needing AT may be:

- Either beneficiaries of schemes with limited provision for AT access or AT information or non-beneficiaries, thus having inconsistent access to information or to AT itself;
- Living in rural or remote Australia or other places where markets are “thin” i.e. there is a lack of local information, or places to trial/demonstrate or acquire AT and seek post-sales support;
- Living with another form of disadvantage, for example: being Indigenous or from a Culturally and Linguistically Diverse (CALD) background; being from a lower socioeconomic group where affordability is prohibitive; and/or having a lack of personal support to assist them in sourcing information and appropriate AT;
- Being provided advice that is biased, misinformed, not up-to-date, incomplete, conflicting, not tailored to their specific needs, not able to be trialled, or does not cover maintenance issues. This quality of service issue is closely related to information asymmetry, but is also related to the fact that accessing and assessing information is not a costless activity, so the consumer will never have fully complete and accurate information.

Abandonment or discontinuance of use (Davin 2020), is commonly around 20% (Sugawara et al, 2018) but can be 50% or more (Salminger et al 2020). AT abandonment can result in reduced ability for healthcare providers to offer high quality care, reduced outcomes for consumers, social exclusion and funds wastage (Sugawara et al 2018), as abandoned AT is not easily recovered. Abandonment impacts across countries and practice areas, and rates have not changed much over time, despite advances in technology (Salminger et al 2020). Causes of abandonment include: discomfort, changing needs, poor

⁷ Since government subsidies also involve rationing, as governments do not have unlimited resources, the goal should be for a scheme that rations equitably, such that an extra \$100 of subsidy to person X for AT will give the same amount of wellbeing to person X as the wellbeing received by person Y from an extra \$100 of subsidy.

Economic evaluation of Assistive Technology in Australia

durability/reliability, high maintenance, poor safety or fit with multiple needs, lack of consumer-centredness/communication, training and follow-up, general ‘dislike’ for equipment or negative beliefs about use (e.g. due to conflict with personal identity or perceived stigma), lack of knowledge or perception of usefulness of equipment, poor aesthetics, lack of funding, challenging procurement or maintenance processes, cultural factors, and/or poor accessibility and physical environment factors.

A systematic literature review showed there are factors in almost all the different stages of service delivery that affect **satisfaction with AT**, which if unmet, lead to its underutilisation and abandonment including: a specific needs assessment; information (from internet, suppliers and user manuals) and communication are accessible and collaborative; the therapist and user both agree to the AT choice; the AT and the process for obtaining it meet expectations; there is clear documentation of goals and processes; and there is training and support with continued quality follow-up, including maintenance and ongoing learning about the AT and what it can do (Larsson Ranada and Lidström 2019).

1.4. Aims and methods of this analysis

This report first looks at the characteristics of AT information provision (Section 2) based on the previous literature review, discussion and inputs from the reference group. Section 3 then introduces two different AT information models to compare in the economic evaluation, while Section 4 describes the framework for evaluating the benefits and costs of those models in terms of the effectiveness, efficiency and equity criteria for the analysis. Section 5 applies the framework to each of the two models using numeric data and Harvey Ball comparisons, draws conclusions about each model based on comparison, and provides recommendations. Section 6 outlines implications of the analysis and provides references for the material used in the report. Appendices provide additional information.

2. Characteristics of AT information provision

This Section examines how AT information is provided in Australia and overseas, and the particular characteristics that foster effectiveness, efficiency and equity (defined in more detail in Section 4).

2.1. Literature review and international findings

D'Cunha et al (2021) systematically reviewed literature around information asymmetry and brokerage, and highlighted that potential and existing AT users desire:

- greater access to information from trusted impartial sources, including health professionals, peers with AT use experience, and other brokerage services;
- consumer empowerment in decision-making and service delivery, including AT selection, demonstration and trials of AT, being informed of emerging technology, training and maintenance of AT post-sale - which all improve outcomes and satisfaction.

In Australia currently, consumers can gain information about the most appropriate AT for them by any of a combination of: purchasing directly from AT suppliers; consulting with clinicians; accessing government schemes (for some) from a regulated list; visiting local centres to have equipment demonstrated and trial it; or using databases or peer support and reviews online. One Australian study highlighted the growing use of global web AT databases (Steel et al 2016), as well as local websites

Economic evaluation of Assistive Technology in Australia

(Section 3). Impartial brokerage can be part of this process. An emerging trend is towards larger collaborative services complemented by web-based information, supplemented by smaller local centres where people can test AT and ask specific questions. A one-stop shop or replicable approach is important when a combination of AT devices are needed by an individual, to ensure compatibility and to generate economies of scale in information and access to the AT items.

The European literature highlighted innovative approaches in some countries. For example, in Sweden, Dahlberg et al (2014) noted that each county has an Assistive Technology Centre (ATC) “gatekeeper” that provides brokerage for professionals seeking AT for their consumers, with access through the National Insurance Scheme for “free” i.e. with no out of pocket (OOP) payments, and consumers can also access AT loans and vouchers in some counties. Another Swedish study (Tsitsidis 2021) showed fear of technology as a barrier to lack of consumer information and choice. In Norway, Pederson et al (2020) highlighted Norwegian ATCs offering consumer testing, Q&A, and individualised information provision, so consumers can participate as well as having a professional broker – following the growing EASTIN⁸ (European Assistive Technology Information Network) user involvement focus. Another Norwegian study Gramstad et al (2013) showed that unmet needs for AT were caused mainly by information gaps and socio-cultural factors, and that professionals were limited in their ability to help if AT does not work properly or is ineffective. In Italy, four strategies used were web databases, helplines, phone or face-to-face guidance and guided visits to ATCs (Andrich 2007).

A United Kingdom (UK) study found that the major barriers to electronic “assisted living technology” for 50-70 year-olds was lack of information and thin markets, with a brokerage model the optimal solution (Ward et al 2017). An older study (Cowan and Turner-Smith 1999) reported that 60% of survey respondents had a problem with AT information and access, mainly due to funding issues, information availability, maintenance, training, switches, assessment and delays in supply. The UK now has an AT database with a self-assessment tool (AskSARA) (<https://asksara.livingmadeeasy.org.uk/selector>) that generates a report on relevant AT devices, demonstration centres, and suppliers. In Ireland (Craddock & McCormack 2002) found that Technical Liaison Officers (all brokers with disabilities) led to greater impartiality and expertise, and generated consumer satisfaction with purchases.

Turning to North America, the US had AbleData, similar to EASTIN, but it was defunded in 2020 (Lowe 2011). US studies noted the importance of demonstration and training using testing labs and lending libraries (Utley 2006), of collaborative consumer-centric problem-solving (Mirza and Hammel 2009) and of keeping up with new technology options (Newton 2002). In Canada, an older study (Ripat & Booth 2005) also emphasised user participation in training and maintenance of AT, while a later study reports on the Equipment and Assistive Technology (EATI) consumer-led AT program, a ‘participation model’ where professionals and consumers conduct collaborative assessment and selection processes brokered by trained caseworkers called Navigators; evaluation showed higher use of AT and greater user satisfaction with economic implications (Johnston et al 2014).

⁸ Wouters (2015) notes the EU portal has over 70, 000 products available 5,000 suppliers, and global collaborative access by consumers and professionals.

2.2. Consumer choice and the need for empathy

A mantra of the NDIS since its inception has been “choice and control” for consumers. For those outside the NDIS and for many within it, choice is limited due to information asymmetry and other barriers to AT access as reported in the summary of the literature review findings above. “Consumers” is used in this report to describe those trying to access information about AT and/or AT itself either for themselves or others. The term “users” refers to people with disabilities who ultimately use the AT, in line with Steel et al (2016) .

The literature review demonstrated that engaging AT users in information access, the opportunity to test and be trained in AT use, professional and peer support, and providing ongoing knowledge about maintenance and emerging new AT, were essential elements for appropriate and efficient AT access.

In all aspects of the consumer journey, empathy is a key element of care, incorporating attentiveness, responsibility, competence and responsiveness (Gruen, 2019). Empathy is typically, but not always, provided best through peer support processes, reviews, empathic professional and brokering experiences, and supportive families and carers.

2.3. Roles of skilled professionals, peers, consumer reviews, suppliers and impartial brokers

A common theme of all evidence regarding information and access to effective, efficient and equitable AT is the role of independent parties (professionals, peers, reviews or impartial mega-suppliers) acting as brokers by providing advice and assistance bridging the gap between the consumer and the service provider or seller.

While professionals can act on behalf of consumers, the literature suggests that consumer involvement is critical in achieving optimal outcomes. Similarly, while peers and other consumers may provide views or reviews of different AT items, these views may be conflicting and not always skilled or tailored to another individual. Suppliers may have a vested interest in advising consumers to purchase what they sell, rather than the most appropriate item. Brokers may not be skilled or empathic.

Overall, the literature review showed that skilled brokerage without vested interest, through any or a combination of these channels, improves consumer outcomes. The findings from D'Cunha et al (2021) indicate:

AT brokerage services that involved an independent advisor were more effective at identifying the appropriate AT for the user and ensuring that the consumer has as much information as possible, and this was associated with more sustained use of the AT. This included the use of trial centres and voucher schemes which both enable consumers to take an active role in the decision-making process and purchasing of AT.

2.4. Voucher and allowance options

The Nordic countries appear to have trialled voucher systems more intensively than other countries. Advantages of vouchers or allowances are that they may enable great flexibility in selection of the most appropriate and tailored AT, with consumer self-determination, professional advice, and peer input. An

Economic evaluation of Assistive Technology in Australia

allowance is a sum of money paid to a consumer to meet the need for an AT expense. A voucher is similar in concept but may specify within a range of products or sourcing options rather than a totally free choice in regard to how the funding is spent to meet needs. In Australia, allowances are typically more common.

However, without these enabling factors, information asymmetry remains, allowance/voucher limits or thin markets may preclude socioeconomically disadvantaged groups from the most appropriate AT option. The Norwegian model suggested that collaborative inputs to voucher usage and quantum, involving consumers, professionals, peers and funders, is ideal.

2.5. Loans and hiring options

Some European and North American models have loan or hiring options rather than purchase options to avoid the significant issue of AT abandonment and to enable the re-use of AT by others once it is no longer wanted (for whatever reason) by the previous user. Loans are appropriate to trial AT and also where needs might change in progressive conditions (e.g. Multiple Sclerosis or Motor Neuron Disease), especially where supply chain issues can cause long delays in thin or highly specialised markets. However, loans still require information and funding mechanisms appropriate to the consumer need.

Means-tested or non means-tested hiring is a supplementary option to loans. This transfers to some extent the funding burden from government or NFP organisations to the consumer. It helps address the abandonment issue but still requires solutions to the other information asymmetry matters. If hiring is not means-tested and funded by consumers, it will be less equitable.

2.6. Databases, AI and algorithms

The advantages of web-based repositories is that they can assist AT users in undertaking background research and they may facilitate communication with other AT users through reviews or chat functions. The main Australian-based internet repositories are those of (1) the ATA and (2) Indigo through NED, noting that both organisations offer services much broader than just their data repositories.

However, databases alone are not sufficient to provide for all the needs identified in this section that would optimise effectiveness, efficiency and equity of AT information and access. Disadvantages include that, if they are not impartial or sell products, they may be biased in their information provision. They do not alone currently allow the opportunity for trialling, training, maintenance support or loans/hires. They also do not alone provide tailored support, and contain tens of thousands of options for AT items, that may be overwhelming or confusing for consumers without professional or tailored support in decision making. Finally, consumers turning to international databases may have misinformation in the Australian context, affordability and supply-chain issues (particularly with COVID-19 with importation).

In the AskSARA model, which was developed by the UK Disabled Living Foundation, the self-assessment tool that accompanies the database enables consumers to start with a “need” for those not aware of the kind of AT they are searching for, which ultimately generates information on product options, as well as local show rooms in particular regions that users can visit to trial AT items. There is, however, the risk of impartial databases being summarily de-funded (as with AbleData in the US) and few options for their viability beyond selling services (such as online products or training) that may induce perceived or actual non-impartiality. Sustainability is a key issue for consideration in database models.

Economic evaluation of Assistive Technology in Australia

There is also the potential for algorithms or artificial intelligence (AI) introduced into AT databases or supplementary information provision to be inappropriate and un-empathic. Unless they are of very high quality, chatbot add-ons or “find out what you need” surveys can add to frustration and misinformation in AT decision making. People with disability are quite rightly suspicious of any system which takes away their choice and control - whether it be an IT algorithm or experts who purport to know what the person with disability needs. Any proposed algorithm needs to be evaluated by users to ensure choice and control is enhanced by the system.

3. Options for comparison

This section outlines two options to compare in the economic evaluation: the ATA model and an alternative model of “better practice” combining elements from the Section 2 review of characteristics for effectively, efficiently and equitably providing information and access to AT.

3.1. Description of the ATA model

ATA employs health professionals and consumers to provide expert advice that is impartial (not affiliated with any AT supplier), training, and awareness around AT and its role in aiding independent living. ATA also aims to provide “leadership that builds capacity and optimises the value of AT in leading a life of choice.”⁹ The website offers an accessible home virtual tour of the Blacktown Independent Living Centre (ILC) showroom with a display kitchen, lounge, bathroom, bedroom and corridor featuring special items that viewers can click on to get more information.¹⁰ The information comprises features of the item, and suppliers where the item can be purchased. There are a variety of items from height-adjustable cupboards/benchtops to AV aids, flooring materials, C-BUS systems and bed-hoists.

ATA is a non-profit Public Benevolent Institution. It was previously known as Independent Living Centre NSW. The website displays logos of the Commonwealth Department of Health (DOH) and the NSW Department of Communities and Justice (DCJ) as an acknowledgement of their funding.

ATA is a founding member of the Coalition on Rehabilitation Engineering and Assistive Technology, Asia. In 2015 the 13 CREATe ASIA alliance partners signed a Memorandum of Agreement whereby the alliance aims to advance the cause of AT across Asia. In September 2016, ATA became an associate partner of EASTIN and the Australian contact for AT in Europe. As EASTIN grew to become the Global Assistive Technology Information Network, ATA became a full partner of EASTIN.

⁹ Cited from the ATA website <https://at-aust.org/>

¹⁰ Unfortunately the links to click on the information in some cases didn’t work and, if working, were insecure, being blocked by devices with high security settings, with the message: “Your connection is not private. Attackers might be trying to steal your information from ilcnsw.asn.au (for example, passwords, messages or credit cards). This server could not prove that it is ilcnsw.asn.au; its security certificate is from www.at-aust.org. This may be caused by a misconfiguration or an attacker intercepting your connection.” This and the number of “dead links” (don’t go anywhere) may be a deterrent to people trying to access the information.

Economic evaluation of Assistive Technology in Australia

The ATA website and service offers information in the form of brochures, a 1300 line open 9-4pm, email help, appointments with Allied Health Professionals (AHPs), visits to the display centre for AT trials or community talks where the ATA visits the community group (fees may apply to guided visits and community talks).

A database on the website can be searched by item or by searching individual categories (Appendix 1). The website also contains an explanation of what AT is, types of AT (Aids for Daily Living, Augmentative Communication, Computer Access Aids, Environmental Controls, Home/Workplace Modifications, Prosthetics and Orthotics, Mobility Aids, Recreation, Seating and Positioning, and Sensory Aids for Vision/Hearing Impaired). The website also links to access consultancy offerings and projects (e.g. for the built environment or universal design) as well as access and home modifications training, including nationally accredited courses for Continuing Professional Development credits (all fee-based).

3.2. Description of an alternative model

While there are great strengths in the ATA model, there are also some characteristics that are absent (e.g. real-time feedback loops) which will be discussed more and compared in the following sections. As such, the characteristics of an “ideal” AT information and access model are proposed here, based on the literature review findings and reference group consideration. These characteristics include all of the following:

1. An impartial database of AT with the ability to purchase through the database, and to consequently collect user satisfaction data including abandonment information that site browsers can access.
2. A screening questionnaire based on users’ particular needs for assistance as in AskSara, with algorithms to provide advice as to next steps.
3. Loan/hire, training and maintenance options available, as locally as possible.
4. An allowance/voucher system for choice of AT similar to some profiled in the Nordic models.
5. Well-supported peer-led mechanisms for exchange of information between users and consumers with trained, impartial peer mentors¹¹.
6. Independent expert input into information seeking and decision making processes.
7. Incentives and disincentives that encourage the provision of empathetic trusted advice regarding AT.

All of these model elements would have rich feedback mechanisms that could be used to facilitate continuous quality improvement (CQI) and efficiency.

These technical characteristics of a digital AT database suggest certain principles by which it should be managed.

1. It will be costly to create. This raises the question of how such efforts should be funded.
2. Once created, the cost of servicing additional users of the database is effectively zero.

¹¹ The consumer, if not a user (as per Steel et al 2016 definitions), may also need to accompany the user to liaise with the mentors and experts. Note that this does not rule out feedback from peers who are untrained or impartial who may provide input in other feedback loops, but access to higher quality mentors who have used the AT themselves and have received training in mentoring is optimal. Such peers are usually paid (i.e. staff at showrooms or advisors) although some may choose to volunteer (noting this should not be an expectation).

Economic evaluation of Assistive Technology in Australia

Point 2 suggests that the most efficient amount to charge for users to access the database is zero — because a positive price would see people missing out on a service which cost nothing to provide. However, this leaves us with the dilemma of how to fund the construction and maintenance of the database. The providers of goods and services in a market have no interest in providing information to users except to sell them products. This process can work quite effectively and is the main means by which people choose products in a supermarket. Moreover online, numerous databases such as those provided by Amazon, eBay or iSelect provide a reasonable source of information for products in the process of selling or rating them.

However, there are weaknesses with this model. Generality of coverage and seeking to take the user's perspective are important values for any database. But both of these are compromised by a user pays model. Where a database is funded by firms whose products appear on it, it will have an incentive to favour products that pay it the most (for instance by making them more conspicuous in search results). And even where this problem is avoided — as it can be with uniform payments or various governance rules — the database will generally need to exclude from coverage those firms that won't pay to be on it, which introduces a similar source of bias.

These problems become more acute where:

- consumers find it difficult to inform themselves sufficiently to choose between items. This will particularly be the case where the differences between products are technical; and/or
- markets are relatively thin.

Further, although such market driven databases can provide worthwhile information — particularly where the alternative is no information — in some fundamental sense the database only serves the interests of AT users to the extent necessary to serve the interests of AT providers. Such a system is unlikely to encourage empathy or fiduciary relationships between providers and users.

The alternative is some collective form of funding. This could be provided by government, or by some compulsory levy on the system. This leaves the question of the governance of the database. Here it is consistent with the importance of empathy and of the capturing of information from the bottom-up, for the database to be governed as a community asset.

Some barriers to being able to implement an ideal model stem from various factors.

The first of these is the “public good” aspect of the database element. In economics, a public good refers to a commodity or service that is costly or impossible to exclude others from using it and/or when one person uses a good or service, it does not prevent others from using it. Access to clean air to breathe is a classic example of a public good. The provision of defence services by a nation is another example.

For the provision of information in a database it is possible to exclude people from using it, so information provision does not satisfy that part of the definition of a public good. However, it does satisfy the second part of the definition in that one person accessing information in a database does not prevent others from using it. Public goods cannot be sold in markets, so normally they are administered by governments and paid for collectively through taxation.

Because the provision of information in a database results in negligible marginal cost for the provider in an extra user accessing the database, there are enormous economies of scale with information

Economic evaluation of Assistive Technology in Australia

databases. When the marginal cost is zero, the optimal price for access to the database which maximises utility is zero. From a welfare economics perspective, the main problem is finding the optimal way to fund the fixed cost of establishing the database i.e. which option reduces welfare the least. Taxes are generally superior for funding information databases compared to other sorts of charges.

However, alternatives to taxes should be considered. In the case of AT this could be by either a subscription purchase to the site by the user (noting this may reduce equity of access for those on low incomes), by advertising on the site, or by linking sales from the site (e.g. suppliers' subscriptions) to a return to the site provider/maintainer. The latter element may still be impartial if there is a competitive supplier market and no preference provided to any particular seller, including products whose sellers do not subscribe to the site. To incentivise suppliers to subscribe, other perceived "rewards" such as direct links to orders/purchasing may occur..

Second, the screening questionnaire must be fit-for-purpose and developing such a service suffers the same "public good" constraints as databases, in that they are not amenable to unit pricing and the overhead of developing and maintaining them must be paid for in some manner. It may also be useful if more than one need can be entered into the algorithm and that the interface is empathic and accessible by different population sub-groups, including disadvantaged groups, taking into account individualised needs and circumstances. Thus the screening tool must be supported by a human for more complex cases where expert professional or peer support can then provide input before frustration sets in.

A third barrier is that some markets will always be thin, so trialling, loaning/hiring, training and maintenance services for AT users, for example in rural and remote parts of Australia, may continue to be inhibited by distance factors and travel or freight costs.

Allowance or voucher systems should allow for complexity and tailoring in some cases and recognise that AT needs and costs do not follow a normal distribution curve, but rather are distributed with a "long right tail", meaning that unit costs cannot fall below zero, with a majority of costs per person clustered at a lower range than those of a smaller segment of the population whose unit costs may be much higher.¹²

Exchange of information between peers, experts and users should not follow a hub and spoke approach but be collaborative, so that information provided to the user is as consistent as possible. This may occur when a consumer can liaise with an impartial expert and peer at the same time; for example an OT, expert peer and consumer having joint interaction, or the expert peer being the same person as the impartial expert (i.e. receiving adequate training to be "expert"). However, real time feedback such as comments on sites or satisfaction ratings should be acknowledged to vary, as different people will have different experiences with the same product. Thus users should be acutely sensitive to the reality that feedback from other users may not be impartial nor expert.

Finally, the mechanism for provision of incentivising and/or disincentivising empathic information regarding AT requires public funding. A key message to NDIS, aged care and other funding channels for

¹² In right-skewed distributions the median and mode fall below the mean, including Gamma and other such distributions – see for example: <https://www.itl.nist.gov/div898/handbook/eda/section3/eda33e6.htm>

AT is that such information is not a “soft” service, but is indispensable to optimising met needs, averting wastage, and enhancing wellbeing for people navigating the AT sector.

4. Criteria for comparisons

In order to compare each of the three options in the previous section, the criteria of effectiveness, efficiency and equity are each considered. Without detailed quantitative data for each option it is challenging to make economic comparisons so a mixed methods approach has been adopted, which is explained more and implemented in Section 5. This section looks at the criteria themselves, and how each could be applied to draw qualitative and potentially quantitative conclusions about various options for AT information and access.

4.1. Effectiveness

Effectiveness is defined by the Productivity Commission (PC 2013) as “the extent to which stated objectives are met”. The PC goes on to add that: “Using this framework, a service would be judged to be more effective in achieving its objective if, say, it provided better quality services or better access to consumers. Service options could then be ranked in terms of their degree of effectiveness.”

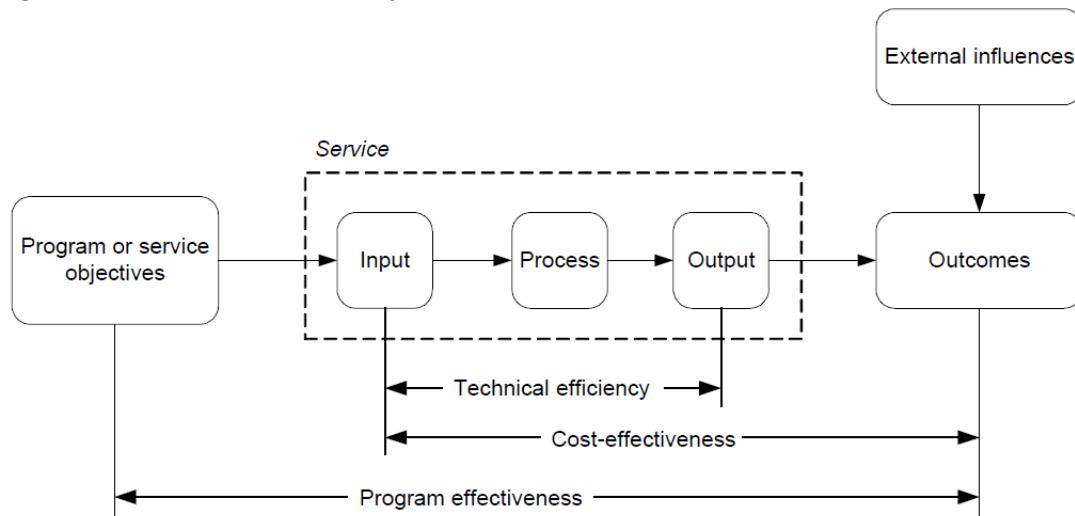
As such, effectiveness measures the quality with which desired objectives are met. In the context of AT information and access, the objective is for the consumer to be able to access the most appropriate AT to meet the consumer’s need in a timely and empathic manner.

- Quantitative key performance indicators (KPIs) might then be the number of consumers accessing appropriate AT in a timely and empathic manner, abandonment rates, or overall satisfaction levels with their AT and the information and access process measured using a Likert scale.
- Qualitative KPIs could include how much consumers value the interaction, trust the provider, or recommend the process to peers. Such information could be collected through surveys or through feedback comments on a website or social media.

The PC contrasts effectiveness with efficiency, by noting that effectiveness compares objectives with the quality of outcomes, while technical efficiency compares inputs with outputs. Figure 1 also contrasts these concepts with cost-effectiveness, which compares inputs with outcomes.

Economic evaluation of Assistive Technology in Australia

Figure 1: Effectiveness, efficiency and cost-effectiveness

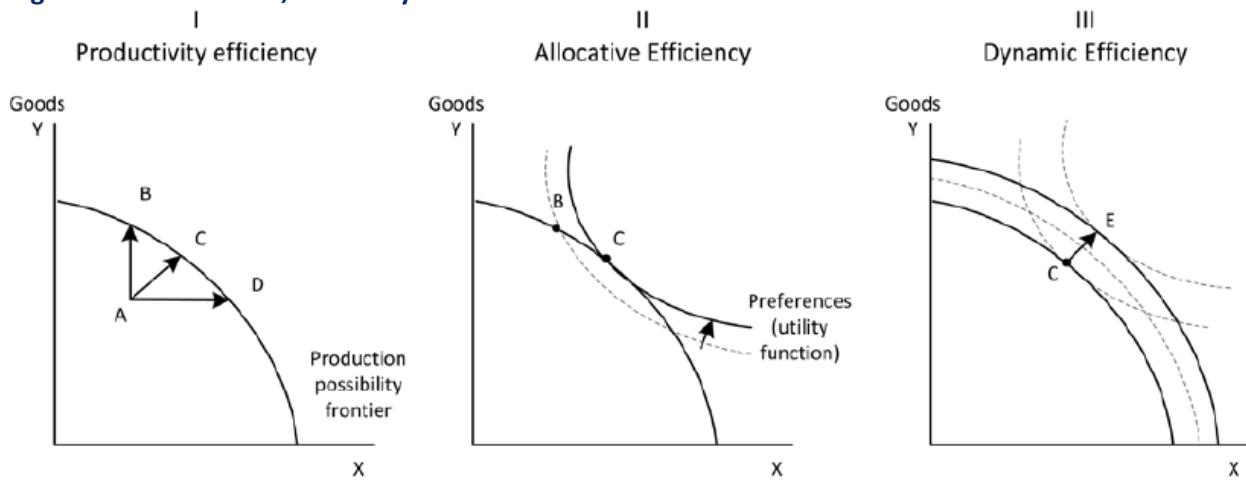


Source: Productivity Commission 2013.

4.2. Efficiency

Efficiency is defined by the PC (2013) as when “individuals in society maximise their utility, given the resources available in the economy. The concept of efficiency has a number of dimensions. Overall economic efficiency requires satisfaction of productive, allocative and dynamic efficiency (Figure 2).

Figure 2: Effectiveness, efficiency and cost-effectiveness



Source: Productivity Commission 2013. Note: “Goods” includes services here.

Productive efficiency (Panel I) is when output is produced at minimum cost i.e. no more output can occur with available resources; the economy is on its production possibility frontier (PPF) e.g. B, C, D. Moving to these points from A would increase productive efficiency, and it thus assumes technical efficiency, since an input cannot be reduced without decreasing the output or increasing another input.

Allocative efficiency ensures the community gets the greatest return (or utility) from its scarce resources i.e. where the PPF intersects the Utility Function. In Panel II, C contributes more to wellbeing than B.

Economic evaluation of Assistive Technology in Australia

Dynamic efficiency reflects resource allocation over time, which means finding better ways of producing goods and services through more resources available (labour and capital primarily), technological advance or innovation – a movement from C to E in Panel III and a shift outward of the whole PPF.

- Quantitative KPIs for allocative efficiency in the context of provision of AT information and access might then be the dollars spent per consumer to access appropriate, timely AT or the dollars spent on the search and acquisition compared to the value of abandoned AT
- Qualitative KPIs could include the degree of value for money that consumers report they received in interactions with AT information sources, or whether they viewed the assistance to information and access to AT as efficient, saving them time, money or effort in getting the information they need to make an appropriate AT selection. As with effectiveness, such information could be collected in surveys or through feedback loops.

4.3. Equity

As discussed in Section 1.3, to optimise resource allocation in providing information (potentially subsidised) to consumers seeking AT, equity is also important in addition to effectiveness (quality and appropriateness) of the AT and efficiency (lowest cost for a given level of quality, appropriate AT).

Achieving equity can be difficult especially given that some people in the target population will live in rural or remote areas, have special or complex needs, or for some other reason be part of a “thin” market where competition may not be sufficient to ensure that supply can meet needs to the degree that is optimal.

- Quantitative KPIs for equity could comprise the proportion of sub-populations gaining appropriate information relative to the average or in contrast to comparator populations, e.g. those living in rural or remote areas relative to those in metropolitan areas, those under 65 and those 65 and older, Indigenous and non-Indigenous, those with and without a CALD background; those in different socioeconomic groups, and those with access to a funded scheme (e.g. NDIA, CHSP, HCP, DVA, other) relative to those without such access.
- Qualitative KPIs could include whether consumers report feeling disadvantaged in their AT information and access journey relative to others, possibly using a Likert survey question or free-field text response including the reasons they report such feelings of disadvantage and suggestions to reduce the level of disadvantage experienced.

4.4. Using the criteria to evaluate the options

Data requests were made to ATA¹³ to see whether any of the quantitative or qualitative information could be supplied to enable KPIs to be calculated to inform the evaluation of options using the Effectiveness, Efficiency and Equity criteria. As well as the data supplied by ATA, judgment was used to assess each option using a Harvey Balls approach. Harvey Balls are round ideograms used for visual communication of qualitative information. They are commonly used in comparison tables to qualitatively indicate the degree to which a particular item meets a particular criterion. For the purposes of the evaluation in the next section, five Harvey Balls are used as follows:

¹³ A data request was also made to Indigo, who declined to provide data.

Economic evaluation of Assistive Technology in Australia

-  Does not meet criterion
-  Meets criterion to a small degree
-  Meets criterion to a moderate degree
-  Meets criterion to a high degree
-  Criterion fully met

5. Evaluation of options using criteria

Due to a lack of data, the evaluation of options is less quantitative than hoped, and a key issue arising from this analysis is that, in future, more data are needed to inform best practice for understanding how AT information and access can be improved in Australia, bearing in mind effectiveness, efficiency and equity objectives. Such data should include the types of KPIs listed in Sections 4.2 and 4.3. It would be in the strong interest of national funding bodies such as the NDIA, DOH, DSS, DVA, as well as national data hubs (e.g. the Australian Institute of Health and Welfare) or state funding bodies (e.g. DCJ) to fund the collection of these data, to track progress and help ensure Continuous Quality Improvement in relation to how their funding of AT information and access achieves its desired outcomes. Of particular relevance would be consumer satisfaction data about AT information and access, abandonment rates, and cross-sectional data for target population sub-groups i.e. those with disabilities who are funded/not funded, of varying age, gender, SES, ethnicity, Indigenous status, or living in rural/remote compared to metropolitan areas.

5.1. EEE Harvey balls of ATA and KPI calculations

ATA provided data to evaluate its effectiveness, efficiency and equity. The information provided is presented in Appendix 2, and comprises two types of information. First, there is descriptive information about ATA consumers, including the disability type, gender and age stratification of (a) Infoline users and (b) of people making appointments and visiting the centre, as well as the proportion of Infoline inquiries who are users, relative/friends, health professionals or others. Second, there is output data regarding:

- **Appointments and visits:** Number of appointments/visits at the centre, Number of group tour participants, and Number of attendees at expos, talks, community visits;
- **@Magic database:** Number of hits to the database;
- **Infoline:** Number of Infoline services provided;
- **Training:** Number of students trained and training revenue.

From an effectiveness perspective, the output data below are the annual averages for 2018-19 to 2020-21. The annual average for the period 2018-19 to 2020-21 is used in calculating output to partially adjust for the fact that the output data is affected by COVID.

- **Appointments and visits:** 299 visits at the centre, 302 group tour participants, and 293 attendees at expos, talks, community visits; a total of 893 services in this channel¹⁴;
- **@Magic database:** 6,009 hits to the database;
- **Infoline:** 6,195 Infoline services provided;
- **Training:** 245 students trained.

However, there are no data on whether the services enabled consumers to access *appropriate* AT in a timely and empathic manner, abandonment rates, or overall satisfaction levels with their AT and the

¹⁴ Note this may include the same person undertaking multiple visits, so many not represent unique clients.

Economic evaluation of Assistive Technology in Australia

information. Feedback provided to ATA, however, is generally positive, showing that consumers tend to value the interaction, trust the provider, and recommend the process to peers.¹⁵

Other considerations from an effectiveness viewpoint on the range of services that ATA provides are as follows:

- **Strengths:** ATA is impartial and expert, and its staff include trained peers who are updated on recent AT changes¹⁶, it provides links to international databases to supplement @Magic, it includes email as well as phone help, and its showroom enables outreach as well as trials.
- **Weaknesses:** ATA does not provide loans or allowance/voucher options, it has no real-time peer or other feedback loops on its database, and its face-to-face reach is limited mainly to Sydney plus parts of NSW and ACT.
- **Threats:** A significant threat is removal of block funding.
- **Opportunities:** ATA has expanded training operations overseas which may expand revenue in future, but total revenue from training is small (around \$207,000 annual average over 2018-19-20 to 2020-21 in Australia and overseas), compared to current block funding of around \$1.8 million in 2020-21.

From an efficiency perspective, ATA's annual reports provide financial data on overall expenditure (\$1,439,482 total expenses in 2020-21), and ATA also provided the share of staff time involved in: appointments and visits at the centre (7.3%); updating and maintaining @Magic (11.3%), answering Infoline requests (30.1%); providing training (18.8%). The residual of staff time (32.4%) was spent in support, management and other activities. Treating the residual as an overhead to factor up the shares of the first four staff time allocations to 100%, provides shares of 10.8%, 16.8%, 44.6% and 27.8% respectively. Applying these shares to 2020-21 expenditure and dividing the dollar inputs by the effectiveness outputs showed the following technical efficiency ratios:

- $\$155,919 \text{ expenditure} / 893 = \$174.60 \text{ per appointment/visit}$
- $\$241,121 \text{ expenditures} / 6,009 = \$40.12 \text{ per hit on @Magic database}$
- $\$641,568 / 6,195 = \$104 \text{ per Infoline service}$
- $\$400,874 / 245 = \$1,636 \text{ per person trained}$

The data are insufficient to calculate allocative efficiency, since each appointment/visit, @Magic hit, Infoline service and person trained does not necessarily equate to one consumer's information and access to appropriate, timely AT. Moreover, while the inputs reflect ATA's costs, they do not include the time value of the consumers or others (e.g. health professionals or informal carers) that is spent on search, training and acquisition. There is also no information to compare to the value of abandoned AT,

¹⁵ The data source was from Excel spreadsheets that ATA provided UC covering 175 visitor comments over October 2014 to January 2019, and service evaluation feedback from 51 clients over 2017-2020, so the periods are not strictly comparable.

¹⁶ ATA reported it includes trained people with disabilities in its front line service information delivery. These Mentors all have a Certificate IV in AT Mentoring and staff are reported by ATA to be up-to-date in changes in technology (smart, digital, monitoring and robotics) and standards related to its work e.g. ATA has recently launched its Augmented Reality service. See <https://assistivetechnologyblog.com/2017/03/four-reasons-augmented-reality-will-change-assistive-technology.html>

Economic evaluation of Assistive Technology in Australia

the value for money that consumers report they received, or whether they viewed the assistance to information and access to AT as efficient, saving them time, money or effort.

From an equity perspective, the descriptive data showed the following for consumers across (a) Infoline services and (b) appointments and visits:

- Around 52% were under 65 years, while 48% were over 65 years. This compares with 56% and 44% of all Australians with a disability, and 51% and 49% of those with a profound or severe disability (who are likely to be over-represented in seeking AT). As such, and considering that those with profound and severe disability comprise only 32% of all Australians with disability, the ATA consumers appear to be accessing services in accord with equity expectations, by age.
- Around 58% were female, while 42% were male. This compares with 51% and 49% of all Australians with a disability, and 53% and 47% of those with a profound or severe disability (who are likely to be over-represented in seeking AT). As such, and considering that 20% of Infoline users, visitors and appointments are carers, and over 70% of carers are female, suggests the ATA consumers appear to be accessing services in accord with equity expectations, by gender.

The data are insufficient to consider other sub-populations such as those living in rural or remote areas, Indigenous and CALD Australians, and those in different socioeconomic groups with different access to funded schemes and hence varying ability to pay out-of-pocket. There is also no information on whether consumers, or those who are not ATA consumers, report feeling disadvantaged in their AT information and access journey relative to others, the reasons for that, or their suggestions regarding what would be most important to them to change their experience of disadvantage. It is a stark reality that many people will not invest in a thorough information search for access to AT, if they believe after preliminary investigations that they cannot afford the AT they need, due to affordability or other barriers. This is highly inequitable for those in lower SES groups or without the supports they need to embark on an information search.

In summary, the ATA option is rated as below, based on the strengths and deficiencies discussed above.

	Effectiveness	Efficiency	Equity
Option 1 ATA			

5.2. EEE Harvey balls of Alternative model

Key differences between the ATA model and the Alternative model are:

- The inclusion of real-time feedback loops in services related to AT information and access
- The ability of the impartial AT database to collect follow-up information post-purchase regarding satisfaction or return/abandonment, that site browsers can access
- A screening questionnaire based on users' needs, with algorithms to provide advice as to next steps
- Loan/hire and maintenance options available, as locally as possible
- A voucher system for choice of AT for those not able to access it through other funding pathways
- Incentives/disincentives for provision of empathetic trusted advice regarding AT, across Australia

Any cost increase associated with these extra elements would need to be associated with higher outputs and outcomes (e.g. equity) in order for the Alternative model to maintain or enhance efficiency. The main problem to solve then, is how to fund the extra elements in order to enhance and not reduce any

Economic evaluation of Assistive Technology in Australia

aspect of effectiveness, efficiency and equity relative to the ATA model. This raises a number of sub-problems, addressed in the discussion below.

The large population of people with disabilities with low needs: At present there is limited funding for AT information and access for the two thirds of Australians who have disabilities without having profound or severe core activity limitations (some 2.95 million people). They tend to miss out on NDIA (below 65) and DOH (65+) packages, although veterans may have DVA funding and others in higher SES groups may be able to affordably fund their own needs. However, the majority of people with disabilities and low needs are precluded and the alternative model aims to provide for these people in four ways:

1. by providing, free of charge, access to a fully interactive database with a screening questionnaire based on users' particular needs for assistance as in AskSara, with algorithms to provide advice as to next steps, and with the capacity to include consumer feedback,
2. by providing, free of charge, access to a showroom for AT along with access to professional and peer advice,
3. by providing, free of charge, well-supported peer-led mechanisms for exchange of information between users and consumers with trained impartial peer mentors, and
4. by including an allowance or voucher system to subsidise the purchase of appropriate AT.

An allowance/voucher system – how could it work? The Nordic voucher models were workable by using an expert health system gate-keeper¹⁷ to assess whether AT is needed and what it needs to address, then providing a voucher to the consumer to select whichever type of AT they choose is fit-for-purpose, with assistance from other information sources (e.g. databases, expert peers), and typically from a range of appropriate items or within a prescribed price limit¹⁸. Dahlberg et al (2014) note that prescribing forms part of a rehabilitation process and is preceded by needs assessment by a licenced practitioner (e.g. a doctor, physiotherapist, OT, audiologist). The prescribing process itself includes providing information, selecting and adapting specific AT, instruction and training, then follow-up and evaluation of function and benefit to ensure it meets goals agreed by the user and prescriber. The prescriber is responsible for each step of the prescription process, although tasks can be delegated to other professionals, such as adaptations of a wheelchair performed by an engineer or training performed by a personal assistant. In the Swedish model (Dahlberg 2014) under the voucher system the user **owns the AT**, in which case the **user is responsible for its maintenance** and upkeep. By contrast in those regions where a locally managed **loan system** was in operation, the local health authority owns the AT. **"Maintenance and repair** are the responsibility of the local health authority. The user has the responsibility to **return AT when it is no longer needed.**" The allowance/voucher system where AT is individually owned does not have provision for regulated re-use of AT when it is no longer needed.

The allowance or voucher system might be means tested, as many within the two thirds of Australians with disabilities who do not get access to existing packages are well able to afford to pay for the AT they need. That said, allowances are likely to be positively correlated in size with the severity of disability, so

¹⁷ If the AT needed by the patient is not considered to be the health authority's responsibility, the patient is advised to buy the AT device as any other consumer product (Dahlberg et al 2014).

¹⁸ The voucher covers items that still require personalised tailoring, and the associated modifications, and there are specified routines for when this occurs.

Economic evaluation of Assistive Technology in Australia

means testing may not be appropriate even on higher incomes if the AT is very expensive. Moreover, this higher income group should not be means tested from access to the fully interactive database as they would get benefits from access to such a database, and there is zero marginal cost in the provider providing more access to the database. Whether this group should be charged something for access to peer-led mechanisms and showrooms should be assessed according to a calculation of the benefit to cost ratio (BCR) of a charging system. There are significant economies of scale with peer-led mechanisms and showrooms so it is not at all clear that the BCR of a system where there was a charge for this group would exceed the BCR of a system where this group was not charged.

- The utility gain per person of the above ways of providing access to AT information and subsidised access to AT would be low compared to those currently funded, but the potential for significant gains in equity and wellbeing are substantial due to the quantum of people in this target group.
- In Australia, the 81 NDIA districts, 73 Aged Care Planning Regions or 31 Primary Health Networks¹⁹ would be well-placed to be used in a voucher system to provide AT information and access across all parts of the nation, and facilitate performance of the gate-keeper role in rehabilitative processes for those with disabilities ineligible for NDIA, aged care or other funding, and potentially with means-testing for those in the highest income/wealth brackets.
- PHNs are block-funded and **block-funding** could be increased to incorporate AT information and access. There is also block-funding in the acute care system for research, training, information provision, and in thin markets.²⁰

The role of ATA and other ILCs in an alternative national AT information and access model: The @Magic database and other services of ATA would continue to be needed since there are significant diminishing average costs in not replicating existing impartial databases, and in the skills, experience and knowledge capital that ATA has acquired regarding peer mentoring, trials, visits, Infoline, training and other areas of its operations. There would also still be a role for other showrooms across Australia to provide similar jurisdictional leadership and face-to-face trial sites with outreach for consumers funded through any mechanism – NDIA, DOH, DSS, DVA or the proposed alternative block-funded voucher scheme. Moreover, these programs should ideally be adapted to offer loans of AT rather than purchase-only options. ATA and other ILCs play an important role and should continue to be block funded in line with other similar services across the health and social services sector that provide offerings in information provision, training, research and trialling for CQI, which enable effective, efficient and equitable outcomes for consumers and for Australia as a whole.

This should not constrain ATA or other ILCs from generating new revenue sources such as international training programs, in order to fund innovation and CQI. Indeed there would be an incentive to have a strong brand for impartiality and trusted advice, and not to use advertising or supplier agreements to supplement funding for growth, as a quality differentiator for customers seeking truly independent sources of information and support. Block and growth funding from new revenue sources could also be used for ongoing learnings from screening questionnaire data, real-time feedback loops and follow-up evaluations, similar to or going beyond the Nordic process of follow-up and evaluation of function and

¹⁹ <https://www.gen-agedcaredata.gov.au/My-aged-care-region> and <https://www.health.gov.au/initiatives-and-programs/phn>

²⁰ <https://www.publichospitalfunding.gov.au/public-hospital-funding/funding-types>

Economic evaluation of Assistive Technology in Australia

benefit to ensure AT meets individuals' goals and outcome KPIs, including for monitoring effectiveness, efficiency and equity over time.

It is acknowledged that block funding models may either under-fund or over-fund depending on circumstances. Where external factors are bringing unit prices down or demand is reducing, block funding models will tend to over-fund in the medium term, while if unit prices are increasing or demand is increasing, block funding models tend to under-fund in the medium term. For AT and others providing AT information and access, the latter is likely the case given that the population is ageing and hence growth in the number of people with disabilities (notably Tier 2 of all ages) is increasing. Moreover, as AT becomes more personalised and complex it becomes more costly, albeit the benefit of this is better health and wellbeing outcomes for users. However, it is likely that there will still be some equity barriers due to rationing of funds and potential wait times or queues developing e.g. for voucher prescriptions, due to workforce constraints or other "catch-up" mechanisms over time.

In summary, the Alternative option is rated as below, based on the strengths and deficiencies discussed above.

	Effectiveness	Efficiency	Equity
Option 2 Alternate Model			

5.3. Comparison and recommendations

Using the Harvey Balls and rationale from the previous two sections, a summary of the two options compared is provided below.

	Effectiveness	Efficiency	Equity
Option 1 ATA			
Option 2 Alternate Model			

Based on the comparison it is recommended that the Alternate Model is adopted where:

- A new voucher system is introduced for (Tier 2 of all ages) people with disabilities not receiving other funding;
- Loans and hires are introduced for AT in existing funded programs, as an alternative to purchases;
- ATA and other ILCs continue to receive block funding with quality and brand based incentives to pursue alternative impartial revenue growth and innovation for CQI;
- More efficient feedback loops are included in all services delivered, including an initial screening mechanism, real-time and follow-up processes and evaluation that considers effectiveness, efficiency and equity improvement over time for the individual and society as a whole.

6. Conclusions and References

Information and access to AT in Australia is hampered by a number of constraints. ATA has attempted to address many of these by expanding its services into areas such as peer mentoring services, so that consumers seeking information have a greater likelihood of impartial expert advice from lived

Economic evaluation of Assistive Technology in Australia

experience. Some of the recommendations ATA can implement but others will rely on Government or third parties to implement.

There are number of core components that contribute to the strengths of the ATA model of service delivery, from the perspective of economic evaluation of effectiveness, efficiency and equity, including:

- A national database @Magic that enables consumers to search for AT items in an impartial manner
- Expert peer mentoring, equipment trials and support through the Blacktown showroom and also through Infoline and outreach and visit supports, with international connections and training
- An ongoing role in Australia for innovation and attention to the AT sector and the needs of the many (4.4 million) Australians who have a disability and may require AT information services.

The ATA model of providing AT information and access was evaluated in this analysis using KPIs of effectiveness, efficiency and equity, and contrasted to a better practice model that addressed the current weaknesses and threats in the ATA model.

ATA's current performance shows that the information services are provided to a range of persons particularly those in Group 2 , but the extent of services that can be provided is limited by the capacity of current blockfunding. Both the NDIA and aged care funded services typically seek to address needs for those who have profound or severe core activity limitations - those in Group 1 - but exclude others. As such, a large but important target group (two thirds of people with disabilities) are left largely unfunded or self-funding by current major funding programs for AT provision under the NDIA and aged care provisions.

ATA's services provision (for Infoline and visits) were assessed against age and gender criteria and were found to align with what would be expected from the target population shares. In terms of effectiveness and efficiency, ATA's KPIs were calculated as:

- $\$155,919 \text{ expenditure} / 893 = \$174.60 \text{ per appointment/visit}$
- $\$241,121 \text{ expenditures} / 6,009 = \$40.12 \text{ per hit on @Magic database}$
- $\$641,568 / 6,195 = \$104 \text{ per Infoline service}$
- $\$400,874 / 245 = \$1,636 \text{ per person trained}$

The better practice model incorporated the following elements in addition to what ATA already provides:

- The inclusion of real-time feedback loops in services related to AT information and access
- The ability of the impartial AT database to collect follow-up information post-purchase regarding satisfaction or return/abandonment, that site browsers can access
- A screening questionnaire based on users' needs, with algorithms to provide advice as to next steps
- Loan/hire and maintenance options available, as locally as possible
- A voucher system for choice of AT for those not able to access it through other funding pathways
- Incentives/disincentives for provision of empathetic trusted advice regarding AT, across Australia

Using the Harvey Balls and rationale, a summary of the two options compared is provided below.

	Effectiveness	Efficiency	Equity
Option 1 ATA			

Option 2 Alternate Model			
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Based on the comparison it is recommended that the Alternate Model is adopted where:

- A new voucher system – possibly means tested - is introduced for (Tier 2) people with disabilities not receiving other funding;
- Loans and hires are introduced for AT in existing funded programs, as an alternative to purchases;
- ATA and other ILCs continue to receive block funding with quality and brand based incentives to pursue alternative impartial revenue growth and innovation for CQI;
- More efficient feedback loops are included in all services delivered, including an initial screening mechanism, real-time and follow-up processes and evaluation that considers effectiveness, efficiency and equity improvement over time for the individual and society as a whole.

References

Andrich R (2007). *Profile and Development Prospects of Assistive Technology Centres in Italy*. Assistive Technology Research Series, 20:662-666.

Australian Bureau of Statistics (2021). *National, state and territory population, March 2021*. Retrieved from: <https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/latest-release#:~:text=Media%20releases-,Key%20statistics,net%20overseas%20migration%20was%20%2D95%2C300>

Australian Bureau of Statistics (2019). *Disability, Ageing and Carers, Australia: Summary of Findings* [Table 1.1 and Table 2.1]. Retrieved from: <https://www.abs.gov.au/statistics/health/disability/disability-ageing-and-carers-australia-summary-findings/2018/44300do010.xls>

Australian Healthcare Associates (2020). *Review of Assistive Technology Programs in Australia: Final Report for the Australian Government Department of Health*. Retrieved from: <https://www.health.gov.au/resources/publications/review-of-assistive-technology-programs-in-australia-final-report>

Cowan DM, Turner-Smith AR (1999). *The User's Perspective on the Provision of Electronic Assistive Technology: Equipped for Life?* British Journal of Occupational Therapy 62(1):2-6. <https://doi.org/10.1177/030802269906200102>

Craddock G McCormack L (2002). *Delivering an AT service: a client-focused, social and participatory service delivery model in assistive technology in Ireland*. Disability and Rehabilitation, 24(1-3):160-170. <https://doi.org/10.1080/09638280110063869>

Dahlberg R, Blomquist U-B, Richter A, Lampel A (2014). *The service delivery system for assistive technology in Sweden: Current situation and trends*. Technology and Disability, 26:191-197. <https://doi.org/10.3233/TAD-140416>

Economic evaluation of Assistive Technology in Australia

Davin K (2020). *Beyond the Fit. Rehab Management*. The Interdisciplinary Journal of Rehabilitation 33(2):14–17.

D'Cunha NM, Isbel S, Gibson D, Naumovski N, Goss J (2021). *Information asymmetry and assistive technology: the role of brokerage services*. Report for AHA, unpublished.

Gramstad A, Storli SL, Hamran T (2013). *Do I need it? Do I really need it? Elderly people's experiences of unmet assistive technology device needs*. Disability and Rehabilitation: Assistive Technology, 8(4):287-293. <https://doi.org/10.3109/17483107.2012.699993>

Gruen (2019). *Was Adam Smith a feminist economist? Care—the essay*. The Mandarin. <https://www.themandarin.com.au/103897-nicholas-gruen-care-the-essay/#:~:text=Adam%20Smith%20was%20a%20feminist,Care%20the%20essay%2D%20The%20Mandin>

Johnston P, Currie LM, Drynan D, Stainton T, Jongbloed L (2014). *Getting it "right": how collaborative relationships between people with disabilities and professionals can lead to the acquisition of needed assistive technology*. Disability and Rehabilitation: Assistive Technology, 9(5), 421-431. <https://doi.org/10.3109/17483107.2014.900574>

Larsson Ranada A, Lidström H (2019). *Satisfaction with assistive technology device in relation to the service delivery process—A systematic review*. Assistive Technology, 31(2): 82–97. <https://doi.org/10.1080/10400435.2017.1367737>

Lowe SW (2011) *AbleData.com's Leap Into the Future*. Assistive Technology Research Series, 29:198-204.

Mirza M, Hammel J (2009). *Consumer-Directed Goal Planning in the Delivery of Assistive Technology Services for People who are Ageing with Intellectual Disabilities*. Journal of Applied Research in Intellectual Disabilities, 22(5):445-457. <https://doi.org/https://doi.org/10.1111/j.1468-3148.2009.00495.x>

National Aged Care Alliance (2018). *Position Paper: Assistive Technology for Older Australians*. Retrieved from: <https://agedcare.royalcommission.gov.au/system/files/2020-06/COT.9999.2222.0008.pdf>

National Disability Insurance Agency (2021a). *Assistive Technology*. Retrieved from: <https://ourguidelines.ndis.gov.au/supports-you-can-access-menu/equipment-and-technology/assistive-technology>

National Disability Insurance Agency (2021b). *What is the NDIS?* Retrieved from: <https://www.ndis.gov.au/understanding/what-ndis>

Newton DA (2002). *The impact of a local assistive technology team on the implementation of assistive technology in a school setting*. In: ProQuest Dissertations Publishing.

Pedersen H, Kermit PS, Söderström S (2020). *You have to argue the right way: user involvement in the service delivery process for assistive activity technology*. Disability and Rehabilitation: Assistive Technology, 1-11. <https://doi.org/10.1080/17483107.2020.1741702>

Economic evaluation of Assistive Technology in Australia

Productivity Commission (2011). *Disability Care and Support: Report no. 54*. Retrieved from:
<https://www.pc.gov.au/inquiries/completed/disability-support/report>

Productivity Commission (2013). *On efficiency and effectiveness: some definitions*, Staff Research Note. Retrieved from: <https://www.pc.gov.au/research/supporting/efficiency-effectiveness/efficiency-effectiveness.pdf>

Ripat J, Booth A (2005). *Characteristics of assistive technology service delivery models: stakeholder perspectives and preferences*. Disability and Rehabilitation 27(24):1461-1470.
<https://doi.org/10.1080/09638280500264535>

Salminger S, Stino H, Pichler L, Gstoettner C, Sturma A, Mayer J, Szivak M, Aszmann O (2020). *Current rates of prosthetic usage in upper-limb amputees: Have innovations had an impact on device acceptance?* Disability and Rehabilitation, 1-12.
<https://doi.org/10.1080/09638288.2020.1866684>

Steel E J, Layton NA, Foster MM, Bennett S (2016). *Challenges of user-centred assistive technology provision in Australia: shopping without a prescription*. Disability and Rehabilitation: Assistive Technology 11(3):235-240. <https://doi.org/10.3109/17483107.2014.941953>

Sugawara AT, Ramos VD, Alfieri FM, Battistella LR (2018). *Abandonment of assistive products: Assessing abandonment levels and factors that impact on it*. Disability and Rehabilitation: Assistive Technology 13(7):716-723. <https://doi.org/10.1080/17483107.2018.1425748>

Summers MP, Verikios G (2018). *Assistive technology pricing in Australia: is it efficient and equitable?* Australian Health Reviews 42(1):100-110. <https://doi.org/10.1071/ah16042>

Utley B (2006). *Technology Lab on a Shoestring: Developing Low Cost Evaluation Centers and Lending Libraries*. Assistive Technology Research Series, 18:135-139.

Tsirtsidis A (2021). *Challenges in the provision of digital technologies to elderly with dementia to support ageing in place: a case study of a Swedish municipality*. Disability and Rehabilitation: Assistive Technology 16(7):758-768. <https://doi.org/10.1080/17483107.2019.1710774>

Ward G, Fielden S, Muir H, Holliday N, Urwin G (2017). *Developing the assistive technology consumer market for people aged 50–70*. Ageing and Society, 37(5):1050-1067.
<https://doi.org/10.1017/S0144686X16000106>

World Health Organization (2011). *World Report on Disability Chapter 1 Understanding Disability*
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj4wbqlt9_0AhWxwjjGHR9EAyEQFnoECAMQAw&url=https%3A%2F%2Fwww.who.int%2Fdisabilities%2Fworld_report%2F2011%2Fchapter1.pdf&usg=AOvVaw3QEWTGTikLjQ-TQqwYQMhv

World Health Organization (2018). Assistive Technology. <https://www.who.int/news-room/fact-sheets/detail/assistive-technology>

Wouters M (2015). *EASTIN European assistive technology information network*. 2015 Conference on Raising Awareness for the Societal and Environmental Role of Engineering and (Re)Training

Engineers for Participatory Design (Engineering4Society).
<https://doi.org/10.1109/Engineering4Society.2015.7177905>

Appendix 1: ATA database categories

- **Beds and Bed Equipment:** mattresses, pillows, backrest and leg-rest positioning, elbow and skin protectors, bed raisers, bed rails, bed transference.
- **Building Requirements/Design:** basins, toilets, bidets, showers, baths, whitegoods, slip-resistant floorings, water temperature controls, taps, doors, gates, hinges, rails, fixed ramps, switches.
- **Clothing and Dressing:** bibs & clothing protectors, body-worn back supports, body protectors, dressing aids.
- **Communication, Phones, Reading and Writing Aids:** communication devices, audio and braille publications, reading aids, writing aids, telephones, clocks, alerting devices, speech and sound amplification, emergency call systems.
- **Computer Access:** keyguards, keyboards, mouse, switches, mouth sticks, head pointers, computer software, ECU.
- **Continence Products:** bed and chair protection, disposable and reusable pads and pants, uridomes, catheters, enuresis alarms.
- **Eating and Drinking:** cutlery, plates, bowls, plate guards, trays, drinking aids.
- **Environmental Control:** sensors, remote controls, home automation systems and accessories.
- **Hire:** resources/services from government, hire companies, community/support organisations.
- **Household Aids:** can and jar openers, containers, tap turners, scissors, slip-resistant aids, key holders, reaching aids, trolleys.
- **Hygiene:** bath boards, shower chairs, commodes, shower trolleys, toilet supports, portable bidets, change tables, medication, hair care, oral hygiene, weighing devices.
- **Library and Resources:** reports, surveys, guides.
- **Lifting, Transferring and Standing Equipment:** slings, hoists, lifting and transferring aids, stairlifts, stair-climbers, ladders and steps, standing frames, evacuation equipment.
- **Maintenance and Repairs:** companies, suppliers, and organisations that offer AT servicing, maintenance and repairs
- **Organisations and Services:** AT related organisations and resources
- **Recreation:** gardening aids, art/craft equipment, sports, games, holidays, home entertainment.
- **Seating:** lift chairs, office chairs, lounge chairs, kneel-sit chairs, legrests, footrests, chair raisers, neck supports, back & body supports, harnesses, portable resting seats.
- **Sensory Processing and Cognition:** calming, weighted, fine motor, gross motor, oral motor, and other sensory equipment, memory and sleeping aids.
- **Transport:** vehicle seating, vehicle transfer aids, lifters and trailers, seat belts and harnesses, driving controls, driver assessment and education, parking regulations.
- **Vocational Aids & Equipment:** desks & workstations, wrist and forearm supports, portable and angled work surfaces, workstation accessories, keyboard platforms, industrial trolleys and carts.
- **Walking and Mobility Aids:** walking frames, crutches, walking sticks, quadrupods, tripods.
- **Wheelchairs, Scooters, Cushions and Ramps:** buggies, push-chairs, scooters, cushions, postural supports, portable ramps, batteries and chargers, powered wheelchair controls.

Appendix 2: ATA data

Number of appointments/visits, Infoline services provided, group tour participants and attendees at expos, talks and community visits

	2020-21	2019-20	2018-19
Number of appointments/visits at the centre	136	269	491
Number of Infoline services provided	5148	6564	6873
Number of group tour participants	130	368	407
Number of attendees at expos, talks, community visits	310	126	442

Disability type of Infoline users and of people making appointments and visiting at centre

2018-2019	Disability Type	Infoline %	Disability Type	Appts & Visits %
	Physical Disabilities	35.5%	Physical Disabilities	34.7%
	Frail / Aged	12.9%	Multiple Conditions	20.8%
	Neurological	8.0%	Neurological	9.8%
2019-2020	Disability Type	Infoline %	Disability Type	Appts & Visits %
	Physical Disabilities	25.0%	Multiple Conditions	28.2%
	Neurological	15.3%	Physical Disabilities	25.2%
	Frail / Aged	11.7%	Neurological	10.2%
2020-2021	Disability Type	Infoline %	Disability Type	Appts & Visits %
	Physical Disabilities	25.4%	Multiple Conditions	23.3%
	Neurological	19.8%	Physical Disabilities	21.4%
	Frail / Aged	9.1%	Neurological	13.6%

Economic evaluation of Assistive Technology in Australia

Gender of Infoline users and people making appointments and visiting at centre

**2018-
2019**

Gender	Infoline %	Appts & Visits %
Female	50.7%	54.4%
Male	39.1%	36.5%

**2019-
2020**

Gender	Infoline %	Appts & Visits %
Female	55.9%	48.3%
Male	40.0%	39.0%

**2020-
2021**

Gender	Infoline %	Appts & Visits %
Female	55.6%	53.5%
Male	38.7%	35.9%

Proportion of Infoline users people making appointments and visits aged 60-65 and 65+

**2018-
2019**

Age	Infoline %	Appts & Visits %
60-65	5.0%	7.8%
65+	42.5%	50.2%

**2019-
2020**

Gender	Infoline %	Appts & Visits %
60-65	4.8%	12.4%
65+	38.9%	47.3%

**2020-
2021**

Gender	Infoline %	Appts & Visits %
60-65	2.5%	12.1%
65+	66.7%	41.4%

Economic evaluation of Assistive Technology in Australia

Proportion of Infoline inquiries and appointments who are 1. Users, 2. Relative/friends, 3. Health professionals and 4. Others

2018-
2019

Age	Infoline %	Appts & Visits %
Users	38.5%	69.8%
Carer/Advocate	23.6%	19.5%
Health Professional	23.2%	7.1%
Others	14.6%	3.6%

2019-
2020

Gender	Infoline %	Appts & Visits %
Users	38.4%	79.5%
Carer/Advocate	28.5%	12.1%
Health Professional	20.7%	5.1%
Others	12.4%	3.3%

2020-
2021

Gender	Infoline %	Appts & Visits %
Users	38.7%	76.3%
Carer/Advocate	24.6%	10.8%
Health Professional	19.6%	7.6%
Others	17.1%	5.3%