

# **ECONOMIC PATHWAY ANALYSIS FOR ASSISTIVE TECHNOLOGY: A PILOT STUDY FROM AUSTRALIA**

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## **BACKGROUND**

Assistive technology (AT) is a key strategy to enable health and wellbeing by minimising the effects of functional impairment and facilitating activities and participation. AT ingredients (that is, provision of products and of services to evaluate, adapt, install, maintain and review) are however inconsistently provided (MacLachlan & Scherer, 2018). Eligibility for AT differs according to jurisdiction, disability type, and demographic factors leading to inequitable outcomes depending on where, when and why factors (Productivity Commission, 2011).

Research on the costs and cost-offsets of AT and related interventions indicates the effectiveness and value of investment in equipment and adaptation to avoid health costs in four key areas:

1. Saving by reducing or removing completely an existing outlay (save cost of Residential Aged Care; reduce cost of home-care).
2. Saving through prevention of an outlay that would otherwise have been incurred.
3. Savings through prevention of waste.
4. Savings through achieving better outcomes for the same expenditure. (Audit Commission, 2004; Connell, Greal, Olver, & Power, 2008; Heywood & Turner, 2007)

Beyond cost savings, a diversity of outcomes are reported for AT. Primary or patient level outcomes are viewed from the person's perspective and relate to self-determined goals and achievements, usually in the areas of independence or enabled activity and participation, autonomy (directing one's

life), independence in valued tasks, maintenance of occupational roles, improved quality of life.

Secondary or system level outcomes might include the cost or other system impacts of primary outcomes, for example preserved independence and decreased functional decline leading to reduced hospital admission rates; prevention of secondary complications; prevention of falls; alleviated carer burden, reduced residential care placement, and overall health and community life outcomes resulting from improved quality of life.(Lofqvist, Nygren, Szeman, & Iwarsson, 2005; Mann, Llanes, Justiss, & Tomita, 2004).

Standpoint theory demonstrates that the value placed upon outcomes varies according to the motivations and incentives of different stakeholders (De Jonge, Layton, Vicary, & Steel, 2015). Based on human rights and human capability theory (Nussbaum, 2011) a method was sought to capture the human and fiscal impact and outcomes of AT bundles (that is, the full set of AT supports and services which people require). The method needed to be person-focused, that is, located around the individual AT user. The method also needed to capture dimensions of meaning to resourcing agents and policy decision-makers.

The research sought to establish the costs and potential benefits of a representative sample of older AT users, and to evaluate policy to deliver these supports. A full Report contains full findings and policy implications, while this Poster summarises the economic method developed and piloted (Layton & Irlam, 2017). Economic Pathway Analysis developed for this study is based upon several key economic studies of AT (Disability Federation of Ireland & Enable Ireland, 2016; Layton, Wilson, Colgan, Moodie, & Carter, 2010; Mitra, Findley, & Sambamoorthi, 2009).

As the commissioning agency was concerned with aged care service delivery, the evidence review and sampling focused on the AT needs of the population over 65 years .

Older Australians usually require multiple AT products and related supports such as reablement strategies and home modifications (DeCrean, Westendorp, Willems, Buskens, & Gussekloo, 2006) (Gramstad, Storli, & Hamran, 2013).

## METHOD

The study conducted an economic assessment by combining clinically indicated AT products and AT services into an AT bundle for individuals across mild, moderate and significant support needs, and estimated the costs and outcomes or 'benefits' identified in the evidence base for each AT bundle. Economic Pathway Analyses were carried out to identify, measure, and value the inputs and related activities of each AT bundle (comprising AT products and AT services) with the resulting outcomes. Outcomes can be measured as:

i) direct cost savings: for example saved downstream costs, or expenditure which is offset, avoided or minimised through AT provision, or

ii) indirect costs savings: improved functioning, psychosocial and participation outcomes which are recognized determinants of health and wellbeing.

Seven AT user profiles were constructed based on WHO ICF (WHO, 2001) to broadly canvass virtually all scenarios for older people living at home in Australia. The estimated profiles provide information on life across all functional impairment types – from subclinical frailty to impairments of the skin, bone and joint, neurological, neuromusculoskeletal, sensory, cognitive and internal systems for the Australian population. These profiles canvassed life for people with mild, moderate, or severe to profound functional limitations.

The costs of AT bundles were estimated in full (including AT services such as allied health or AT support for evaluation, coaching, skill development and monitoring/review), AT installation, and servicing/maintenance cycles.

This is the first time this has been done in the Australian context, as usually these costs are spread over many stakeholders and not provided in one coordinated service. The AT benefits were not fully assessed by the present study. A range of impacts upon satisfaction, autonomy, degree of difficulty, occupational roles resulting from AT bundles were likely but difficult to capture. Costing the tangible savings was a deliberate choice which strengthened the data and provided convincing evidence of potential return on investment.

Key elements underlying the economic analysis included:

- a health sector perspective was taken: encompassed governments and consumers who may self-fund the purchase for their AT need;
- A time horizon of between 1 and 5 years to realize any benefits with the reference year of 2016 for pricing.

Costs were identified based on the rapid evidence review and a stakeholder advisory group who developed:

- A pricing formula for the costs of AT bundles
- AT user profiles
- Proposed AT bundles for each AT user profile
- Cost offsets which included supplement/substitute for support work and for unpaid care
- Downstream cost impacts (General Practitioner visit, Emergency Department presentation, acute admission to hospital, residential aged care admission
- Population impact

Defining the intervention: AT products and related AT services represent a broad set of many hundreds of actual AT bundles, each individually tailored to a person and their environment. Assumptions for this study are based on a program logic model. A wide range of disparate studies see (Layton & Irlam, 2017) provide evidence of the effectiveness of certain

'ingredients' of an AT intervention. This led us to forecast reasonable assumptions regarding the impact of AT bundles. AT services costs were an estimate of an annual assessment to review and update an AT bundle. It is assumed these bundles are largely in place and not newly established.

Australian per financial year can be spent on AT. It is important to note that this comparator was not fully assessed in our study, that is, the detailed implications of spending choices and impact upon outcomes if only \$500 were available. Rather, an indicative statement points out the likely shortfalls for each case profile.

Defining the comparator: Current Australian aged care policy proposes up to \$500

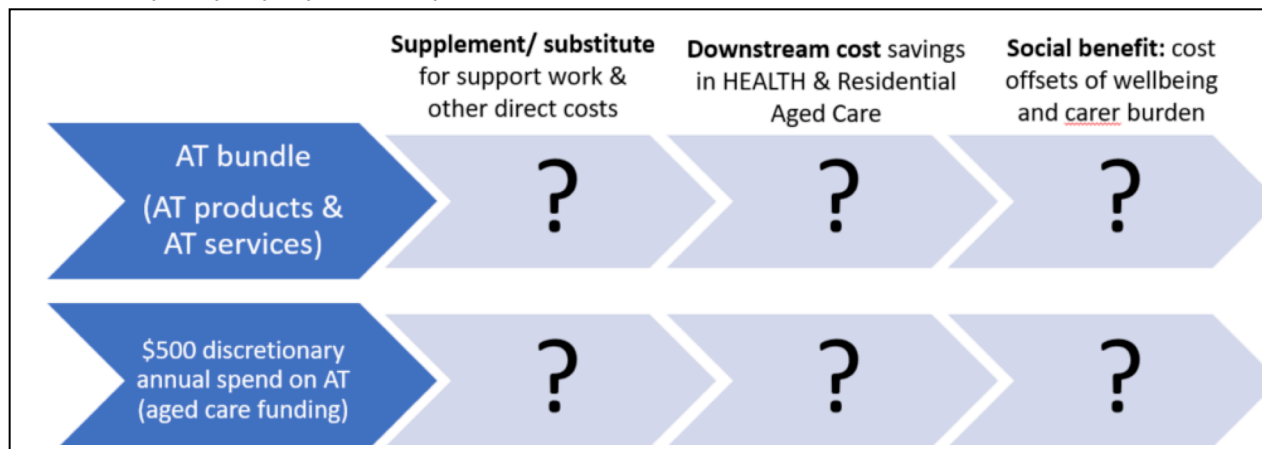


Figure 1: AT Pathway Analysis

### RESULTS: THE EXAMPLE OF ORLANDO

Orlando has moderate functional impairment due to a stroke with associated hemiplegia and aphasia/ dysphagia. Table 1 summarises the total costs of an AT bundle for Orlando (see Box 1) and the total benefits (see Box 2). Extrapolated over a 5 year time horizon.

Table 1 Neurological - Moderate Support AT User Profile

ORLANDO		Time Horizon (i.e. how long will bundle be used for)				
		Base Year	+1	+2	+3	+4
	<i>AT Products</i>	\$12,204.45	\$18,138.90	\$24,073.35	\$30,007.80	\$35,942.25
	<i>AT Services: allied health / coach</i>	\$680.00	\$1,360.00	\$2,040.00	\$2,720.00	\$3,400.00
<b>TOTAL COSTS: AT BUNDLE</b>	<i>AT Services: adaptation/ Installation</i>	\$300.00	\$300.00	\$300.00	\$300.00	\$300.00
	<i>AT Services: maintenance / service</i>	\$50.00	\$100.00	\$150.00	\$200.00	\$250.00
	<b>TOTAL COSTS</b>	<b>\$13,234.45</b>	<b>\$19,898.90</b>	<b>\$26,563.35</b>	<b>\$33,227.80</b>	<b>\$39,892.25</b>
	<i>Supplement Paid Support Work</i>	\$9,880.00	\$19,760.00	\$29,640.00	\$39,520.00	\$49,400.00
	<i>Supplement Unpaid Support Work</i>	\$9,617.92	\$19,235.84	\$28,853.76	\$38,471.68	\$48,089.60
<b>TOTAL BENEFIT</b>	<i>GP Visitation</i>	\$148.00	\$296.00	\$444.00	\$592.00	\$740.00
	<i>ED presentations</i>	\$116.80	\$233.60	\$350.40	\$467.20	\$584.00
	<i>Acute Admissions</i>	\$1,986.40	\$3,972.80	\$5,959.20	\$7,945.60	\$9,932.00
	<i>Res Aged Care Admission</i>	\$10,800.00	\$21,600.00	\$32,400.00	\$43,200.00	\$54,000.00
	<i>Social Benefit</i>	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	<b>TOTAL BENEFIT</b>	<b>\$32,549.12</b>	<b>\$65,098.24</b>	<b>\$97,647.36</b>	<b>\$130,196.48</b>	<b>\$162,745.60</b>

	<i>Net Benefit</i>	\$19,314.67	\$45,199.34	\$71,084.01	\$96,968.68	\$122,853.35
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**Box 1 AT Bundle for neurological impairment:**

Twenty three AT products (one arm drive manual wheelchair with powerpack; gait aid; dressing equipment; adapted footwear; ankle foot orthosis; shower stool, flexible showerhose; handrails; safety mat; temperature valve; one handed cooking equipment, dysphagia eating support equipment: dysphagia cups, & environmental aids to prompt or support safe swallowing; ICT supports; bed supports; dining chair; adapted footwear; medication management; emergency monitoring (personal alarm); nutrition support: thickener; kitchen trolley; chair raiser for lounge chair; communication devices (high or low tech), plus AT services (annual support plus one-off installation costs).

AT services includes two hour of allied health practitioner and four hours of AT supporter/ coach and service costs annually, plus one-off installation and annual maintenance / service costs.

**Box 2 Assumptions of Cost and Benefit:**

With the AT bundle, Orlando is able to manage and monitor his body functions (nutrition, and hemiplegic arm and leg) with thickened fluids, eating supports, orthoses, and a medication reminder/ dispenser. He manages personal and domestic tasks with one-handed equipment and a trolley. Orlando has a walking aid for indoor use as well as a manual one-arm drive wheelchair with powerpack for longer distances and community mobility. Orlando has bathroom adjustments for safety access. Transfers at home are supported by bed mobility equipment and raised seating. A personal alarm and ICT supports (tablet computer and Wi-Fi mean Orlando feels secure alone at home, and is able to engage with the online stroke support community as well as manage billpaying and other executive tasks online. We conservatively estimate that Orlando will save (substitute) 3.8 hours per week of paid support work (home care and instrumental ADL support), noting this is likely a very low estimate. Thirteen and a half hours of unpaid support work are released as Orlando feels safe and autonomous at home, with unpaid supporters able to spend time with Orlando on social and leisure pursuits rather than monitoring and daily living tasks. We avoid one GP visit per quarter due to less anxiety and fewer environmental barriers. Over a 5 year time horizon, we save one emergency department presentation and two acute admissions through decreased falls risk and increased safety, particularly as the AT bundle is reviewed annually. Residential aged care admission is delayed by 18 months.

## RESULTS: OVERALL

Return on investment is positive where:

a) the costs are exceeded by the direct cost savings alone, or

b) a negative net cost occurs where costs are exceeded by total cost offsets, which include direct cost savings and indirect cost savings

In each AT profile, the return on investment was positive. These results demonstrate that spend on AT bundle of products and services can deliver cost effective outcomes and is a good government investment. In all instances, the return on investment was realized within 2-5 years. Even more importantly in the severe/profound AT profiles (Figure 3), a negative "net cost" was achieved in the first year where the expenditures to set up the AT bundle was less than the potential cost-offsets realized in the same year.

In no instance would the Australian aged care annual allocation of AUD \$500 for AT cover the cost of set up in the base year. That is, there is no potential for early intervention or to benefit from early investment in AT, in the current aged care service context.

## CONCLUSION

This data is indicative of substantive potential savings, particularly in relation to Australian population figures.

Pathway analysis is a valuable approach to quantifying costs and benefits of an intervention such as AT.

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