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Assisting Transition



Growth Prospects for the Development of the Assistive Technology Industry in South Australia

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Australian Industrial Transformation Institute

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**Assisting Transition:
Growth Prospects for the Development
of the Assistive Technology Industry in
South Australia**

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1 Key Findings and Recommendations

1.1 Overview

Around the world, but particularly in the advanced Western economies and key Asian economies, populations are ageing, retirees are wealthier than ever before, governments are moving to provide greater assistance to persons with disabilities and new technologies are creating the prospect of longer, more independent, more active and healthy lives. And, of course, the incidence of people with a disability rises in tandem with population ageing.

Individuals and communities are demanding access to assistive technologies (or AT) in line with their higher incomes, requirements for a high quality of life, and the technological innovations that are creating an ever-more vast array of possibilities.

Governments concerned with the rising cost of caring for older persons and those with a disability will support solutions that enable them to be cared for in their homes rather than in dedicated care facilities where the costs are higher. At the same time governments are encouraging older workers to participate in the workforce for as long as possible. Assistive technologies have an important role to play in facilitating these objectives.

In northern Europe, together with the UK and Japan, governments are alert to the potential for industrial development, growth and employment that the emergence of assistive technologies represents. In Australia, where the challenge of ageing populations is similarly significant, governments and industry are yet to fully appreciate the potential for assistive technologies to drive growth in manufacturing and services. Such industry development could go some way towards ameliorating the losses sustained through the closure of automotive assembly and other manufacturing sector closures of the last decade or more.

The need for a focus on accelerated industrial diversification is acute and urgent. At the same time the significant decline in the value of the Australian dollar associated with the end of the mining investment boom has made importing assistive technologies more expensive, potentially creating import replacement opportunities for Australian manufacturers. On the policy front, the rollout of the NDIS and of consumer directed care and greater individual choice for the elderly, and the increasing emphasis on home based care, will all encourage the demand for assistive technologies in the Australian market.

Many medium- to high-complexity AT products and services have characteristics that make them strong targets for industrial diversification. Many are aligned to opportunities in 'new manufacturing', which is characterised by short-run production, high variability and high value, often in market niches where being small need not be a disadvantage.

They make use of new materials and advanced technologies. They are in high and growing demand, exhibiting high income elasticities of demand, meaning that the demand for them rises as income grows, but at a rate faster than the rise in incomes. Hence they can command a premium and good margins. They require and can make use of advanced engineering skills still in use in sectors such as automotive manufacturing.



1.2 Estimating Demand for AT

The estimation of demand for AT is difficult at the aggregate level, and even more so at the individual product or product class level. Nonetheless, by scanning a range of data sources from the Productivity Commission, Disability SA, the Assistive Technologies Suppliers Association, and others, we estimate Australian annual demand at more than \$4 billion, with around 30 percent (\$1.3 billion) of this comprised of medium- to high-complexity AT.

Future growth will be driven by factors ranging from demography, to technology, to issues of individual capacity to pay, new policies and programs, etc. The growth in future domestic demand will be very substantial, with demography being the single most powerful driver.

Compared to 2012, where 20% of the population (4.4 million) was aged 60 years and older, this group will increase to 23% of the population (6.4 million) in 2025, 27% (10 million) in 2050 and 30% (16 million) in 2100. There will also be a doubling in the proportion of Australians aged 85 years or older from 1.9% in 2012 to 4.2% in 2050.

1.3 Industry Opportunity Identification

These broad estimates provide evidence of strong demand growth overall, but they do not confirm a specific industry opportunity for South Australia. A South Australian industry opportunity exists where we can identify specific products or classes of product for which there is growing or unmet demand, and where local companies have the capabilities required to design, engineer, manufacture and market the product competitively.

However, as explained in this report, data limitations and other factors prevent analysis of demand trends and growth at the detailed product level at this stage, and qualify, to a small degree, the ATMO Project's original aim of specifying discrete product opportunities in medium- to high-complexity AT. Rather, opportunity identification is at the broader 'product class' or 'product category' level.

The table below distils the outcomes of our investigations at this level. This distillation is the result of analysis of information sourced from Germany's Fraunhofer IAO, local care and service organisations ('demand side') and local manufacturers ('supply side'). The ordering presented here is not a strict hierarchy. Nonetheless, these product classes represent sound candidates for concrete investigation with local firms.

Table 1: Opportunity: overall rating/concordance

Opportunity	Demand side	Supply side	AITI
FRAUNHOFER OPPORTUNITIES			
Social media/web-communities	Medium	Medium	Medium
Indoor and outdoor navigation	High	High	High
Holistic management systems	High	High	High
Web-based fitness programs/courses and empowerment	High	Medium	High
Telecare/telehealth systems	High	High	High



Service and care robots	No	No	No
Mobility support	High	High	High
Smart TV	Medium	High	High
Nutritional support systems	High	High	High
CARE ORGANISATION OPPORTUNITIES			
Physical training/fitness/rehabilitation equipment	High	Medium-high	High
Assisted mobility products	High	High	High
Global positioning systems, gaming technology, alarms and security devices, telehealth and tele-med apps	High	High	High
Systems and packages for energy and water conservation and efficiency.	High	High	High
Lifting and safety equipment, beds	High	High	High

1.4 Models for Collaborative Industrial Transformation

The ATMO project involved considerable consultation with a broad range of stakeholders that included care organisations, manufacturers, distributors and retailers of medical and assistive products, and other South Australian commercial and government organisations. There was considerable interest in the concept of assistive technologies Co-design Centre or Living Lab. These types of organisations have had significant success, particularly in Europe, in being the focal points for new industry collaboration, innovation and growth. They are designed to encourage the involvement of end users and communities in the conceptualisation, design and development of new products and services and at the same time provide secure environments to support the collaborative development of commercial offerings and facilitate these being brought to market. Critically, they support collaboration for pragmatic outcomes between users, commercial providers and research organisations such as universities.

Even without collaboration between participants in the assistive technology sector and even without government intervention, the AT sector will grow and some additional activity and employment will result. We have identified a number of areas of activity that are inherently local in nature that can be expected to grow as the use of assistive technologies expands.

This 'unassisted' growth will not, however, maximise technological innovation, new product development, or industry diversification. The greater opportunity is to build on this local demand and activity by establishing a network of Assistive Technologies Co-Design facilities (ATCo).

An even larger opportunity beckons if South Australia can establish itself as a centre of AT innovation and solution development in the nation. Several Asian countries, notably China, face the problems of ageing populations but in the context of much lower per capita incomes.



Nonetheless, as per capita incomes in China and the rest of Asia continue to increase, these markets will represent enormous opportunities for AT products and services.

Maximising the economic potential represented by assistive technologies to South Australia requires a new strategic and institutional landscape capable of accelerating the growth of a globally linked AT industry in South Australia. The following section outlines some key ingredients of this for consideration.

1.5 Strategic Directions

An important part of the ATMO project was to deliver policy proposals to capture AT opportunities. A strategy including an Assistive Technologies Industry Development Program and a possible Assistive Technologies Industry Innovation Centre (referred to as AT Co-design Centre in this report) were flagged. A 5-year industry development and an investment attraction strategy for the industry were discussed, based on opportunities identified through the Demand/Supply/Capability process¹.

As previously explained, the targets identified here are proximate 'product classes', due to gaps in data that have prevented further pinpointing at this stage. Further work is therefore required, particularly the application of a co-design approach to AT industry development. Key recommendations to help accelerate the growth of the AT industry in South Australia are provided below.

1.5.1 Living Laboratories and Co-design in South Australia

Living laboratories and co-design have merit in bringing users, care organisations, manufacturers and researchers to drive product and service innovation, exchange knowledge and skills and accelerate the development of industries where strong product and service demand is in existence.

The development of living laboratories and application of co-design principles has the potential to accelerate the development of South Australia's AT industry. As well as providing much needed global AT industry development intelligence and fostering collaboration between key stakeholders, living laboratories can provide a focal point for the design of AT industry development strategies and programs grounded in international best practice. They provide a forum for the involvement of manufacturers, researchers, designers, product and service providers and end users in this process.

Recommendation 1: It is recommended that key stakeholders investigate the development of a network of living laboratories in South Australia to accelerate the growth of a user centred AT industry.

1.5.2 Leveraging Existing Resources

As well as attracting new resources from government and industry living laboratories would seek to leverage existing resources. To ensure an efficient approach it is important that efforts are made to leverage existing resources and programs to assist AT companies and those seeking to diversify into AT, deepen their knowledge and build capability to successfully participate in the

¹ This was also summarised in Spoehr J, Worrall L, Sandercock P, Eyre J, Molloy S. 2014. *Assisting Transition: Assistive technologies opportunities and industrial transformation in South Australia*. Adelaide: Australian Workplace Innovation and Social Research Centre, The University of Adelaide



AT industry. These resources should be directed at AT market research, market entry, investment for innovation and new product development, with a focus on firms at a higher and more immediate level of readiness. They would also be directed at deepening of systems and sub-system integration capabilities and capacity to develop low cost solutions with application to a range of AT products and services.

Recommendation 2: It is recommended that an Assistive Technologies Industry Forum be held in 2017 to foster collaboration and knowledge transfer.

1.5.3 Capability Assessment

Diversification into the production of AT requires detailed enterprise capability assessment and the development of a diversification strategy. There is a need to deepen knowledge of all potential/candidate companies and assess them for potential to transition into AT. The target companies for assistance would, initially, likely be those with a higher and more immediate level of AT-readiness. Beyond this, there is a need to expand the cohort of companies, and deepen knowledge and data bases of the full range of potential companies.

Further work is required to identify the keenest, most capable companies for focus over the short- to medium-terms. These would become target companies for AT co-design projects and wider capacity and capability building including enterprise improvement, addressing capability gaps, clustering, and industry-led research and co-design approaches.

Recommendation 3: It is recommended that an Assistive Technologies Enterprise capability assessment and innovation program be offered to companies interested in diversification into AT product and service development.

1.5.4 Industry Network Development

The development of strategic industry networks can help to leverage demand, foster knowledge and skills transfer and open up new paths to market. There is a need to aggregate demand and build critical mass through industry networks and collaborations involving research organisations, manufacturers, AT retailers and distributors, care and service organisations and public procurement agencies.

Recommendation 4: It is recommended that an Assistive Technologies Industry Network (ATIN) be established to support the aggregation of demand and to build critical mass and support collaborations.

1.5.5 Procurement

The formal and practical elements of current procurement policy/practices should be assessed to ensure any changes required to improve the systems performance in promoting local innovation. Public procurement is one of the key ways in which to promote local innovation and industry development whilst also better meeting the specific needs of end-users.

The introduction of Consumer Directed Care in the aged care and disability care sectors will have transformative impacts on procurement practices. It is important the implications of these new policy directions are fully understood and opportunities to foster AT industry development identified.

Recommendation 5: It is recommended that a review of AT procurement be undertaken to identify opportunities for application of smart procurement principles to help drive AT innovation and AT industry development.





2 About the Project

...it is essential to recognise that the projected changes in demographic patterns present a challenge to Australian business....Consumer demands will increasingly be driven by the tastes and needs of older people. These will range from leisure to education, from health to financial services. Older people in future will be more accepting of technological aids and interventions and will seek to be involved in the design of new systems and devices. With the increasing number of frail old affected by varying disabilities and functional impairment, there is a clear market opportunity, both domestic and international, for products and services that cater to their requirements. It is important to recognise that many of these solutions based on technology are likely to be of benefit to the rest of the population as well as providing the basis for new products for export. ATSE, 2016:8

The emerging demographic mega-trend of population ageing is a powerful driver for increased adoption of assistive technologies in the health, aged care and disability systems and more broadly. Disability rises in tandem with population ageing. At the same time, the focus on persons with disabilities unrelated to ageing – those with disabilities from birth or by mishap – is rising, as evidenced in Australia by the National Disability Insurance Scheme initiative.

The combination of powerful demographic trends along with rising expectations of quality of life for aged persons and new technologies for providing care means that there are substantial industry development opportunities in the area of assistive technologies across health, ageing and disability. Given the magnitude and cost of the aged care challenge and concern about fiscal balance there is a strong drive to use technology to contain costs, achieve productivity improvement and improve care outcomes. A key to this is keeping people healthier and enabled in their own homes for longer, rather than moving them into expensive institutionalised care. AT can be an important factor in achieving this. With demand for AT growing domestically and globally this project seeks to identify the scope and scale of this demand and the steps that are necessary to build a world class assistive technologies industry in South Australia.

The Assistive Technologies Mapping and Opportunities (ATMO) Project is a collaboration between the Department of State Development (DSD), the Australian Industrial Transformation Institute at Flinders University, the former Australian Workplace Innovation and Social Research Centre at The University of Adelaide (WISeR), the Stretton Centre, and Fraunhofer Gesellschaft, Europe's largest application-oriented technology and business extension organisation, and strategic adviser to the project.

For the purposes of this project we employ a broad definition of assistive technologies as devices, software and systems that enable individuals to perform tasks they would not otherwise be unable to, because of age or disability, or technologies that increase the ease and safety with which tasks can be performed. There are more rigorous and specialist definitions of AT, particularly in the disability sector, but our working definition is broad because of our primary focus on industry development and manufacturing.

The purpose of the Project is to investigate the potential to respond to the urgent need to diversify South Australia's manufacturing base, particularly in light of the closure of Australia's automotive manufacturing sector. Opportunities for transitioning manufacturing businesses and workers into new and growing product and service categories in the area of AT is the central focus of the project.

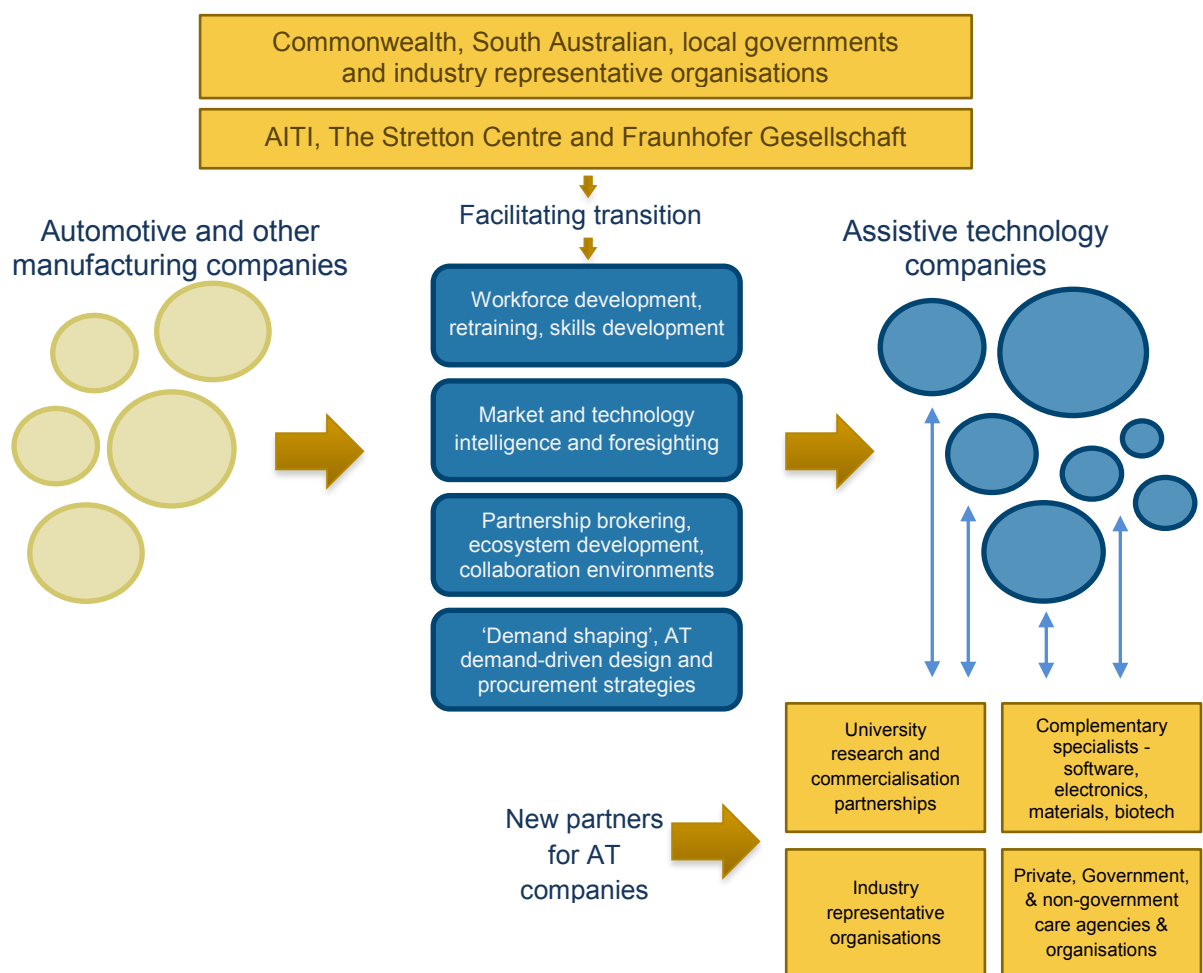


The Australian Industrial Transformation Institute (AITI) has undertaken research that has included consultation with industry and other stakeholders, and on the approach to developing a transition strategy that could be the foundation for an Assistive Technologies Industry Development program (or similar initiative).

The target audience for this report includes businesses in the manufacturing sector (including automotive), South Australian and Federal Government industry and economic development personnel, interested academics, key industry associations², and end-users and lead customers of AT in the aged care, disability care and health care sectors.

The core objective of the project is to identify credible high value industry development opportunities in AT. The project is an industry development initiative, focusing squarely on identifying practical high value opportunities in the high growth AT value chain. Figure one illustrates the different dimensions of the project, emphasising the transformative objectives associated with the development of a strong AT industry in South Australia.

Figure 1: Mapping industrial change



² For example, the Australian Industry Group, the Assistive Technologies Suppliers Association, the Medical Technology Association of Australia, the Australian Rehabilitation and Assistive Technology Association, and initiatives such as the Medical Devices Partnering Program.



The rationale for undertaking the Project is straight-forward: South Australia urgently needs to diversify its industry base. To maintain essential high skills and employment in South Australia it is necessary to respond to the impending loss of sophisticated manufacturing capabilities through diversification strategies. Otherwise key industrial capabilities will be lost permanently.

The current instability in Australian manufacturing has several sources. But today, Australian manufacturing business cannot be competitive where the primary basis of competition is scale and unit cost. Given its cost structures, Australia needs to focus on knowledge-intensive, complex high margin products and services that provide opportunities for internationally competitive manufacturing based on short production runs, medium to high complexity, high variability of output and high levels of customisation. This is 'new manufacturing', and significant segments of the AT market align with it. AT takes advantage of multiple disruptive technologies including additive manufacturing or 3D printing which is revolutionising the way we design and make things. Other disruptive technologies such as nanotechnology and photonics are paving the way for a new generation of assistive technologies products and services.

Opinions differ on the ultimate balance of costs and benefits from dramatic structural change but, recognising that the costs do not fall evenly on all workers and business owners in declining industries, Australian governments have traditionally implemented assistance and industry transition policies aimed at reducing these costs and at facilitating the redeployment of valuable human and physical capital into industries that are experiencing expansion.

Although there has recently been severe cuts in Commonwealth funding support for industry adjustment and diversification, these policies and programs have typically covered skills, education and training, and promotion of industry transition, growth and innovation. Such policies and programs involve a cost but have been justified on the basis that those costs are lower than the benefits they deliver, through overcoming market failures, generating positive spill over benefits, cushioning the impact of shocks (such as closure of the automotive industry) or accelerating the transition to new knowledge intensive activities. The objective of public policy to facilitate industrial change is to maximise sustainable value creation and employment and minimise the social and economic costs associated with these transformations, by transitioning the valuable human and physical capital that has been accumulated in declining industries into industries that are expanding. This process will invariably require repurposing of the productive capital and retraining of workers, and will likely require the development of new partnerships spanning businesses and university researchers.

Industrial development exhibits 'path dependency'. As particular industries decline it is possible for national and regional economies to lose industrial capability and capacity, and rebuilding this capability in the future may prove to be prohibitively costly. This is the path to deindustrialization and lower 'economic complexity', which may foreclose on future economic development opportunities. Even if there are new growth opportunities in manufacturing, the transition path to these new activities is likely to be costly and risky, and affected by multiple market failures, including information asymmetries and other informational failures. Government intervention may be critical in facilitating the transition of labour, skills, knowledge and capital into these new activities. Industry policy designed to facilitate such transition needs to build on the capacities and capabilities of existing businesses, target new products with similar production characteristics to those currently produced ('near-by' products), and address capability gaps to



move up the value chain progressively to more complex and high value products. Building on existing strengths makes a transition from old to new realistic³.

The manufacturing industry in South Australia has assembled a formidable set of capabilities that have generated value, jobs and incomes over the long term. In the face of declining demand for the traditional outputs of the sector, particularly in automotive, there are potentially large benefits from investigating areas of rising demand for products and services that can use these productive resources in new ways.

³ Cesar A. Hidalgo and Ricardo Hausmann et al, *The Atlas of Economic Complexity: Mapping Paths to Prosperity*, Cambridge MA, Puritan Press, 2011.



3 AT in Context

3.1 Overview

It is widely acknowledged that one of the best ways to improve quality of life and to reduce care costs is to enable aged persons to stay independent and at home for longer. AT can be a key to unlock the savings associated with greater independence and better lifestyles for older persons and those with a disability. Rising demand for AT to support increased independence and quality of life has the potential to drive the development of a significant AT industry in South Australia.

3.2 What are Assistive Technologies?

Assistive technologies are defined as devices, software and intelligent systems that enable individuals to perform tasks they would otherwise be unable to, because of age or disability, or technologies that increase the ease and safety with which tasks can be performed. AT has a strong service component, involving complementary interaction between technology and service providers in the design, supply, operation and maintenance of equipment.

This simple definition belies the very broad field of application for AT. Increasingly, the emphasis in aged and disability care is maintaining lifestyle. This means using technology to enable people to maintain activities and independence and continue working despite disabilities and increasing age.

What this means is that the boundaries have become increasingly blurred between technologies designed to assist people who are ageing or those with a disability and technologies designed to simply improve the quality of life for all members of society.

There are a number of ways to categorise the very broad range of products and services that existing in the AT market. One approach is to focus of the complexity of products. The simplest AT products are basic mobility aids such as walking sticks and walking frames. Medium complexity products include relatively simple motorised wheel chairs. Complex AT products encompass motorised mobility devices with sophisticated interfaces, sensor and related IT systems for monitoring biometric data. Examples of AT product categories that span all of these levels of complexity include:⁴

- Aids, appliances and equipment (from handles to special computer interfaces)
- Environmental adaptations (e.g. remote control of doors, windows and locks)
- Remote monitoring devices (telecare and telehealth), and
- Integrated systems (smart homes, etc.).

The key point is that the range of AT products is broad and contains many niches and is characterised by increasing levels of sophistication and specialisation. These will include a range of products and services that can only be supplied by local providers (a relatively small segment of the market for medium- to high- complexity assistive technology), or where local providers could extend on an advantage in the home market (a potentially larger set of opportunities for local industry). AT technologies will encompass wearable computing devices that monitor

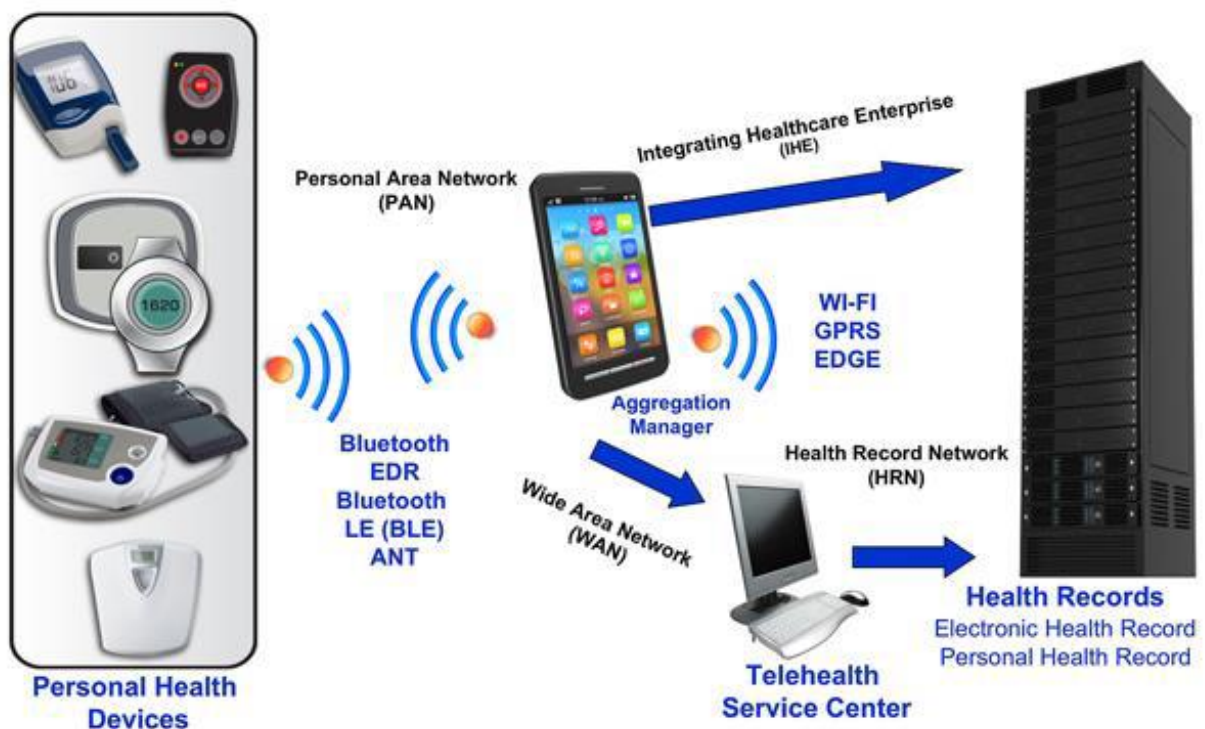
⁴ Connell, Grealy, Olver and Power, Comprehensive Scoping Study on the Use of Assistive Technology by Older People Living in the Community, Urbis for the Dept. of Health and Ageing (2008). The typology likely has equal application to people with disability.



individual biometric data, in-home sensors, and local and centralised information systems that integrate data. Associated with these systems will be monitoring services and the provision of targeted and customised care and medical services. Installation and ongoing maintenance will occur locally; the challenge is to extend the reach of local industry participation to include the design and making of more of the high value technology – devices, systems, subsystems, and their integration.

There will be opportunities for local firms in the modification of homes, installation of smart home technologies and integration of care and monitoring IT and sensor systems. There will also be opportunities for firms to provide services in the area of data analytics. The health data generated by these systems are likely to enable significant improvements in health policy and care strategies. These are just some examples of AT-related opportunities for South Australian companies.

Figure 2: Personalised and distributed health monitoring systems



The development of these types of systems has been constrained to-date by a number of factors including: an absence of widely-accepted standards, concerns about security and medical data privacy and the limitations of wearable computing devices (which are still in a development stage). But this market now appears to be developing and consolidating more rapidly. Apple has recently released 'HealthKit' which is a set of software apps for its iOS devices and a development framework for application developers. This is underpinned by a secure and use-controlled data storage system that protects sensitive medical data.

Appendix C contains the full schedule of AT categories according to ISO classification, with examples only under each two-digit heading.



3.3 The Assistive Technologies Landscape

What are the main features and characteristics of the Australian and South Australian AT industries at present? How will emerging changes in future funding and procurement affect models of care provision, as well as the structure of the local industry? Which are the key organisations and policy initiatives that will shape demand into the future?

First to the **supply-side**, or to local companies producing AT. Much of the Australian industry got underway between the 1970s and 1990s, with business start-ups stimulated in part by discontent with the poor standards of available equipment. End-users together with (mostly) public procurement bodies helped bring into existence a number of AT companies, often with a focus on mobility. These were overwhelmingly SMEs. Companies such as Glide, Magic Mobility and AC Mobility came into being at this time. Whilst these companies continue, many of the other companies from this period have disappeared in the general contraction of Australia's manufacturing over the past decade. This is particularly so of companies producing a standardised product vulnerable to cost-price based competition from Asia.

Today the bulk of Australian companies producing AT are SMEs. Nonetheless, there is a cohort of larger Australian and foreign-owned companies with a local presence with strong technology and market offerings. These are either producers or intending producers of AT, such as Hills Industries (which is focusing strongly on this sector), or companies that are 'near-by' to AT. An example of the latter is Siemens with a leading technology focus on automation, building technologies and health care. A proportion of this cohort of companies might be stimulated in future to become more involved in **local production** of AT were there to be stronger focus on leveraging emerging demand through the kinds of strategic procurement policies adopted in other advanced nations (see below and section 4.1), together with other explicit industry development initiatives of the kind advocated for South Australia in this report.

In South Australia, too, the sector is mostly SMEs, many with excellent systems and sub-systems integration capabilities, specialising in low-cost and flexible solutions. Hills Industries is the largest company in the state with an explicit focus on AT. Several automotive component supplier companies have an interest in AT diversification opportunities. Other companies outside AT but with relevant capabilities also offer major potential.

Flinders University's Medical Devices Partnership program, supported by the state government, has an AT component, noting also the fact that certain medical devices are products 'near-by' AT, with potential spill-overs into this area. At The University of Adelaide, several engineering and technology researchers are undertaking work on new AT.

Overall, however, the state of researcher – company collaboration on AT based innovation is rudimentary, and an area of potential large gains in the future.

The **demand side** of the issue has many facets, all of which are changing rapidly. Two broad aspects are critical: first, national reforms in disability (the National Disability Insurance Scheme and the National Disability Insurance Agency) and ageing (the *Living Longer, Living Better* policy agenda, and Consumer Directed Care); and second, the relatively higher incomes of a larger proportion of today's older population, creating higher effective demand (and differentiating and diversifying the market) for AT and associated services.

The NDIS will be rolled in full in 2018-19 after a number of place-based trials. The aim is to move from block funding of supplier organisations to individualised funding for people with disabilities



based on individuals' needs assessments, and a guaranteed insurance model. It is a competitive, Consumer Directed Care model in which the individual receives annual funding to purchase services, aids and equipment she or he has been assessed as needing, from providers of their choice. The NDIS is to be funded through a Medicare levy payment, which will raise over \$20 billion in 2018-19.

In South Australia, the Department of Communities and Social Inclusion organises very substantial annual procurement of AT, and is playing an important role in the NDIS trials.

With a similar operational philosophy, the *Living Longer, Living Better* reforms target help for older people to stay in their homes, increased support for carers, better residential care facilities, improving the aged care workforce, additional care places, greater recognition of diversity, tackling dementia, and so forth. Again, Consumer Directed Care is intended to provide for more individual choice for recipients. The program runs from five years from 2012 to 2017 and will cost \$3.7 billion (although a large proportion is realignment of existing funds).

Whilst the sums involved in both areas are very substantial, AT suppliers express concern that the competitive model currently favours bulk buying, use of preferred supplier lists and a focus on lowest price. This is held to be at the expense of opportunities for innovation, and bundling of services with products, and to squeeze out local SMEs. It is also held to ignore, in several instances, higher through-life costs of equipment chosen for the lowest **initial** outlay.

More generally, supplier companies and organisations view certain existing regulations to be behind technological advance and stifling of innovation, with instances cited in mobility equipment particularly.

A growing demand component is provided by individual private expenditure by relatively well-off older people or those with a disability. This is in turn an influence on traditional care and service organisations, which are diversifying their service offerings to emphasise greater independence for individuals, a mix of residential and at home services, and the critical role of technology – for the older client or one with a disability, for the health and efficiency of their workforce, and for the productivity of their enterprises.

The most powerful levers in stimulating the development of an Australian and South Australian AT industry are on the demand side. For South Australia, therefore, several key leads must be pursued:

- At the national level, assess policy and practice to align the NDIS, *Living Longer, Living Better* and Consumer Directed Care to support local innovation (on a competitive basis)
- At the state level, procurement by SA Health and the Department of Communities and Social Inclusion must be amenable to stimulating local industry innovation. Again, this would be on a competitive basis and not to the detriment of principles of competitive tendering, but take account of through-life costs and other factors in assessing value. It need not, and should not, apply to all purchases by these agencies but be targeted, sequenced and trialled, to minimise risk while allowing innovation
- At state level, build critical mass through industry networks and collaborations involving research organisations, manufacturers, AT retailers and distributors, care and service organisations and public procurement agencies, involving:
 - Leveraging demand for common items across care organisations and government purchasing authorities, where possible, to create scale



- Leveraging demand from trusted large service organisations such as the RAA, which has adaptable infrastructure and a desire to expand their service offerings to their large and loyal membership
- Build high quality lead customer relationships
- Leveraging, where possible, the market reach of retailers and wholesale importing organisations interested in branding their own products or otherwise supplementing their range with locally produced items
- Enlisting large companies with market reach to mentor SMEs and assist their making inroads to global markets.

An accompanying report by Fraunhofer IAO and other information and analysis assembled here provide strong pointers to the AT industry South Australia could have through a purposeful, strategic and demand-driven approach.



4 AT - A Growth Industry

4.1 AT, Government policy and industry development

In Europe and the UK particularly, there is an emphasis on the growing importance of technology and service applications to meet the challenges of an aging society. Moreover, in many countries, there is an explicit focus on leveraging this demand to create domestic advanced manufacturing to create economic and industry development opportunities. In the UK, for example, the *Ageing Society Strategy* includes 'Industrial Opportunities in an Ageing Society', and use of the Small Business Research Initiative (SBRI) to allow businesses to compete "for Government procurement contracts to incentivise early-stage, high technology businesses and support these companies through critical stages in their development", starting with pilots run by the Department of Health and the Ministry of Defence⁵. Subsequently, the 2011 *Innovation, Health and Wealth* initiative seeks to leverage the UK health system's procurement to grow local technology and business, and commits to an expansion of the SBRI for this purpose. As previously identified, key technologies applicable to assisting the aged persons and people with disabilities include modifications to homes, advances in diagnosis and treatment through telehealth etc., and a suite of technologies and related services, both traditional and emerging cutting edge.

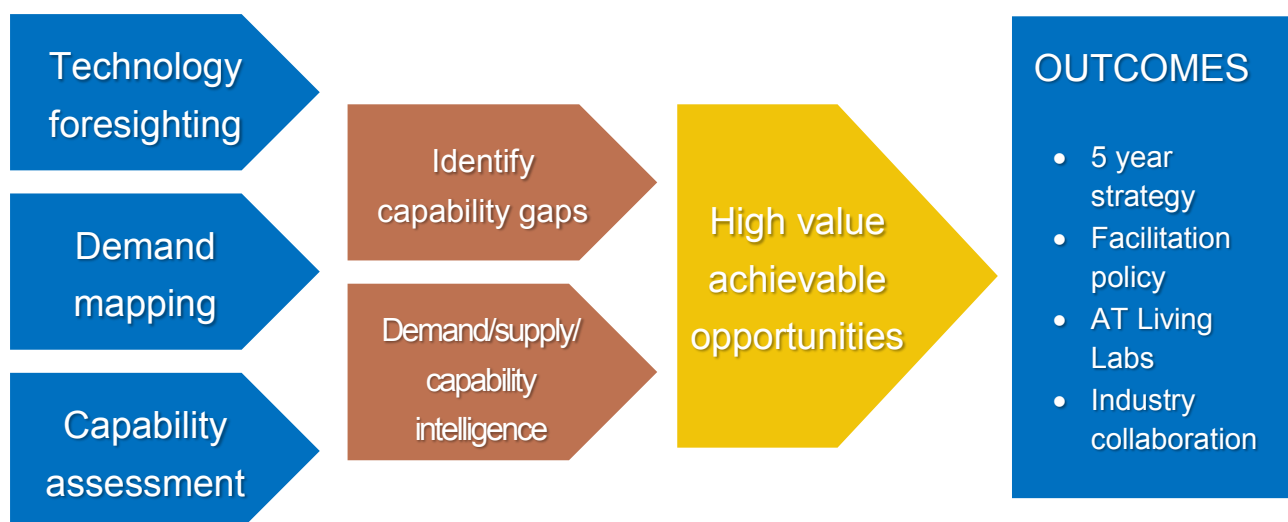
Australia has been slower to recognise the opportunities associated with the development of an AT industry. There is, of course, demand for relevant technologies, but much less of a focus on leveraging this demand for local innovation and industry development.

For example, in Australia, much of the growth in provision of disability technology and services will come from establishment of Disability Care Australia (previously NDIS). Interestingly, the Productivity Commission report recommends the NDIS/Disability Care Australia provides estimates of growth in demand in Australia for support services (but not for manufactured devices).

⁵ Building Britain's Future: New Industry, New Jobs, April 2009, pp. 24-32.



Figure 3: Identifying high value opportunities in AT



The Productivity Commission's report examined the economic impact of improved policy largely from the point of view of increased disability workforce participation and concomitantly reduced transfer payments and dependency. However, neither the specific role of technology in lifting the participation rate of people who are ageing and people with disabilities, nor the potential to leverage this growth in demand to foster new advanced manufacturing and associated service industries, was considered by the Commission.

The National Enabling Technologies Strategy provides some recognition of the importance of AT, but because AT is still aggregated with a range of other technologies and applications, it appears relatively minor.

In the related area of medical devices, the Medical Technology Association of Australia has recently called for measures for 'Building a Sustainable Australian Medical Technology Industry', utilising our existing manufacturing base (e.g., re-deploying the complementary skills sets of the contracting auto industry), leveraging the demand-pull of public procurement, dedicated national institutions and networks, etc.⁶.

The Australian Academy of Technological Sciences and Engineering (ATSE) also recently called for establishment of a network on assistive technologies (or 'emerging assistive and medical technologies (EAMTs)') to better link research to opportunities for commercialisation and production⁷.

In South Australia the Medical Devices Partnering Program based at Flinders University is leading development of South Australian medical technologies for local industry growth. But the fact remains that there is no comprehensive national strategy or approach to assess this large and growing area of demand for AT and identify opportunities for local industry development.

The core message of the previous sections is that the AT market:

⁶ Medical Technology Association of Australia, Building a Sustainable Australian Medical Technology Industry, March 2012, and New Focus to Achieve Our Potential in Medtech ATSE Focus, February 2013.

⁷ ATSE, Australia needs a healthcare "assistive technology" network, media release, 1 November 2012.



- Is already large and will grow significantly and quickly
- Is characterised by a wide range of technically sophisticated and high added value products and services
- Is strongly driven by technological change at the sophisticated end of the market – the diversity of products and services is growing rapidly as new technologies expand the possibilities
- Has a complex value chain that is interwoven with communications, ICT and government policy for aged and disability care
- Will be driven significantly by retiring baby boomers with relatively high disposable incomes and a policy environment often favouring individual choice and provision (e.g., NDIS).

Industry development needs to focus on the local context and global opportunities. Australia is not well-placed to compete in the high volume, low cost simple AT market, in which lower cost producers are dominant. Our opportunities are more likely to be in the medium- to high-complexity parts of these markets.

AT includes market segments that are precisely the type of advanced manufacturing activity that should be targeted to achieve sustainable competitive advantage. At the sophisticated end, AT products and services command high margins. They are, prime facie, suited to high-wage, high cost, high-skill, knowledge-based economies such as Australia's. The technical characteristics of production of many segments within AT mean that competitive production can be achieved at relatively small scale. Frequent new technological developments create opportunities for smaller firms, and clusters of firms, to be competitive internationally.

These potential local advantages are further reinforced by:

- The high service and customisation requirement inherent in the sector, often favouring local activity
- The aged and disability sector's high service and labour intensive characteristics are attractive in a slow-growth labour market
- The potential to use standards, including sophisticated testing and compliance, as a competitive advantage, including rapidity to market, to favour local activity
- The requirement for use of materials that are both very light and very strong, such as titanium (Australia has abundant titanium, and the CSIRO is helping to develop an Australian processing capability)
- The potential to promote transition of firms and workers with adaptable capabilities from declining sectors such as automotive into new growth areas such AT – these synergies include high process engineering skills, expertise in materials science and technology, computer controlled processes, etc.
- The opportunity to use deliberately cultivated closeness between end-users, industry, suppliers, prescribers, funders and the education and research sector
- The potential to leverage public procurement and major projects⁸, initiatives of the 'Manufacturing Works' strategy, the SBIR and the new Industry Participation Policy, the

⁸ Some of the \$120 billion of annual Australian health expenditure can be leveraged in this way, as is explicitly done in the UK, for example.



new RAH and SAHMRI, the Lyell McEwen Hospital upgrade, the redevelopment of the Holden Elizabeth site and the development of the Tonsley Park precinct.

It is important to emphasise that South Australia retains manufacturers with processes, product development capabilities, production capacity and indeed distribution networks, which could be deployed relatively easily into AT production, distribution and marketing.

For example, Hills Industries and Clipsal are already strongly positioned in the smart home market which has many areas of overlap with AT. Clipsal's C-Bus system and products enables advanced security, lighting and entertainment system management in the home and Hills is also selling smart home solutions as well as an activity monitoring system for the elderly called 'Lively'. While Lively is produced by a San Francisco start-up formed in 2012, Hills signed a distribution deal with Lively in 2014⁹ and will use its distribution network and technicians for its TV aerial business to distribute the product.

As a result of a joint-funding agreement with the state government, Hills Industries operates the Hills Innovation Centre from Tonsley park, which will include an AT focus and the Lance Hill Design Centre, and a purpose-built advanced manufacturing facility, showcasing new technologies, new product proto-typing, and providing contract manufacturing services.

A range of smaller South Australian companies are currently working on low cost IT-based solutions, mobility equipment, wearable devices, web-based data and service delivery, and so on.

Outside AT (but 'near-by' in terms of technical characteristics potentially able to be translated into AT opportunities) is a range of somewhat larger companies with diversification potential. Typically, this potential arises from existing strengths in areas such as systems integration, new materials competences, etc. To realise this diversification potential, such companies must identify the opportunity accurately, address technical issues, define the path to market, and confront 'valley of death' issues: financing new investment, often in an environment of falling sales in the traditional product lines, with returns from the new opportunity delayed and possibly uncertain.

In all of these cases, our existing strengths in building systems and sub-system integration capabilities applicable to a range of AT products and services need to be augmented. These competences provide the essential platform for diversification into an array of AT, rather than just one or two discrete products.

⁹ See: Hills Partners With Medical Practices For Lively Monitoring, Kate Mcdonald On 09 September 2014, http://www.pulseitmagazine.com.au/index.php?option=com_content&view=article&id=2064:hills-partners-with-medical-practices-for-lively-monitoring&catid=67:aged-care&Itemid=332 accessed 26/02/2015



Figure 4: Activity sensors and communications AT product



Source: www.mylively.com

Australia already has a number of AT manufacturers particularly in the area of mobility devices, although the last decade has seen significant rise in imports driven by the historically high Australian dollar. Despite the exchange rate challenge, a number of local AT manufacturers continue to operate, for example, AC Mobility. AC Mobility is a Perth based mobility equipment manufacturer and importer. It also designs and produces powered wheelchairs in partnership with the manufacturer called Karma in Taiwan.

Figure 5: Mobility products from Perth-based AC Mobility



Source: www.acmobility.com.au



An important conclusion from this discussion is that South Australia has significant manufacturing capability in sectors that are closely aligned in terms of management, production processes and distribution with medium to high complexity AT products and services. There is significant capability amongst South Australian companies currently operating in AT markets, but greater potential for companies outside AT to enter this value chain. The capabilities of South Australian companies can be applied to growing AT markets and this is more likely to happen if the appropriate policies and collaborations are put in place to provide the information required for sound decision-making by companies, and to address impediments to transition. The required response includes State government interventions to assist transitioning companies as well as establishing effective communications, information sharing, brokering, innovation and collaboration systems to maximise the effectiveness of government policy and respond to current and near-term opportunities in AT.

4.2 Key Drivers of Demand for AT

In Australia as elsewhere in the developed world, population ageing will continue to drive up healthcare spending. By 2050 the number of people aged 65-85 will have doubled, whilst the number of aged persons 85 or over will have quadrupled, and ageing alone will have doubled the cost of healthcare¹⁰. **The ABS estimates that by 2050 those aged 65 or over will comprise nearly one-quarter of the population¹¹.**

Definitions of disability in Australia vary, and those variations affect estimates of the size of the relevant cohorts. The ABS definition of disability¹² provides a cohort of 680,000, whilst the Productivity Commission inquiry used a definition providing an estimated cohort of 411,000¹³. **Disability Care Australia will see the Commonwealth provide \$19.3 billion over the seven years from 2012-13, representing new investment of \$14.3 billion over the period. From 2018-19, with the full national rollout of Disability Care Australia, around 460,000 people with significant and permanent disability will receive support.**

Worldwide the number of persons aged 60 or over will reach two billion by 2050. The EC expects that the proportion of Europe's population aged 65 or more will increase from 17.1 per cent in 2008 to 30 per cent in 2060, a numerical rise from 85 to 151 million¹⁴. It estimates that 45 million Europeans currently have longstanding health conditions or disabilities. In the UK, there is expected to be a 50 per cent increase in the number of people reporting three or more long term conditions by 2018, compared to a decade earlier, whilst dementia sufferers aged 65 or over in England and Wales are expected to grow by 80 per cent between 2010 and 2030¹⁵.

The growth in demand for, and increased production, diversity and sophistication of AT in wealthy societies is correlated to:

- Greater life expectancy and concomitant increases in age-related health expenditures

¹⁰ Medical Technology Association of Australia, Medical Technology: Key Facts and Figures, 2012

¹¹ ABS Australian Social Trends, 2012

¹² ABS Survey of Disability, Ageing and Carers, 2009

¹³ Productivity Commission, Disability and Support, 2011

¹⁴ EC, Analysis of the Assistive Technologies Information and Communications Technologies Industry in Europe, 2009

¹⁵ UK Department of Health, Research and Development Work Relating to Assistive Technology. 2013



- Demands for higher quality disability support and care, resulting in establishment of Disability Care Australia and the national disability insurance scheme
- The general shift towards higher consumption of services as income grows
- The increasing imbrication of services with advanced manufacturing, highly evident with AT
- Rapid technological innovation that makes the satisfaction of these demands possible, alongside the creation of new wants
- Reform in aged care through the *Living Longer, Living Better* policy agenda, a key focus of which is Consumer Directed Care (CDC).

The ABS reports that in 2009 two million people in Australia used aids and equipment because of various disabling conditions. Use of aids was (not surprisingly) most common amongst older people with disability, and was more common amongst those living alone. Notably, 77,500 children under 15 years of age were users of aids and equipment¹⁶. These factors point to strong growth in demand for AT in Australia and other advanced economies and, increasingly in key Asian markets, such as China and Japan.

¹⁶ ABS Survey of Disability, Ageing and Carers, 2009



5 Estimating demand for AT

Estimating demand for AT requires access to accurate and preferably highly disaggregated product level data. Data limitations constrain our capacity to generate detailed AT product level demand forecasts. While AT is of growing importance, there has not been an industry or product classification for which publicly available data have been collected over time. There are a number of partial data sources and in this section we assemble the available information that is relevant to the focus on industry transformation in this project.

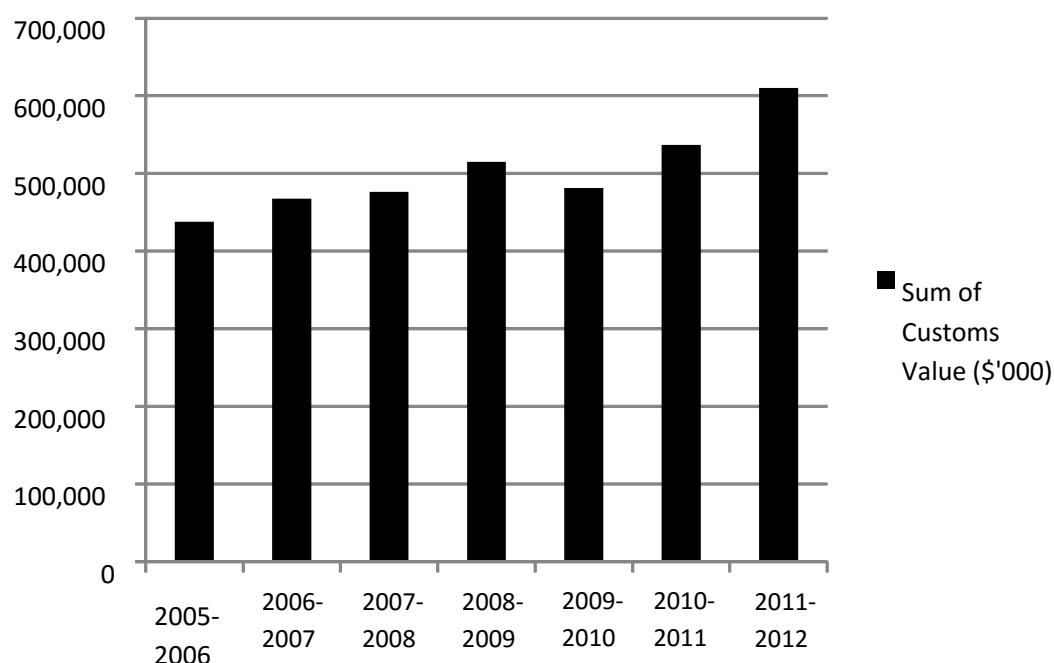
Of course, given the focus on industrial transformation, the likely future levels of activity in the AT sector are of even more interest than the current levels. After we have provided estimates of current levels of activity in this section we will conclude by examining data on the demographic drivers of AT demand and speculating on some of the other forces at work that will drive AT markets in the future.

5.1 Estimating current levels of AT demand

Below we provide some of the data relating to AT demand and activity.

Figure 6 and Figure 7 show imports and exports of AT from customised ABS data¹⁷. These data are useful for indicating the order of magnitude of the AT market but are insufficiently detailed for our purposes.

Figure 6: Assistive technology imports (2005-12)

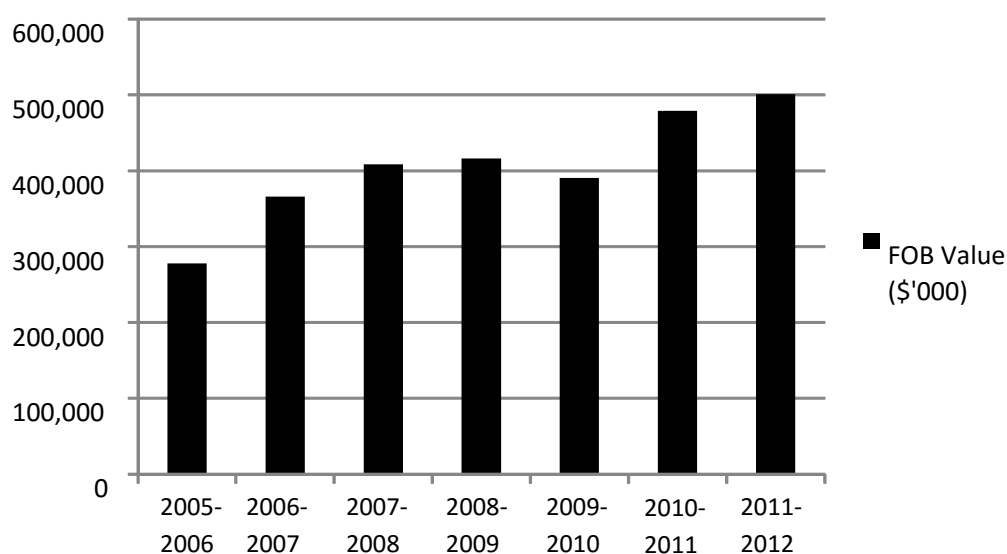


Source: ABS, *International Trade: Customised Report for Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education*

¹⁷ Department of Communities, Child Safety and Disability Services: Research to inform service delivery models that include the application of smart assistive technology, Final report 14 November 2012



Figure 7: Assistive technology exports (2005-12)



Source: ABS, *International Trade: Customised Report for Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education*

While these data focus on AT per se, the definition of AT is quite narrow and are primarily simple AT products and the data are quite aggregated. Again, on the positive side, the data provide dollar values for AT trade and this can be used as a reference for estimates made from other sources. It should be emphasised, however, that import and export data obviously do not include domestically produced AT products and services which are consumed domestically.

The Productivity Commission¹⁸ has developed estimates of the ‘number of people needing aids and appliances’ for the population of persons with a disability estimated to fall within NDIS coverage and the estimated costs associated with meeting the needs of these persons. It also developed estimates of the annual cost of home modification for people with disabilities. The estimates are provided in the tables below.

Table 2: Annual cost of aids and appliances, \$ million

	0-14 years	14-49 years	50-64 years	Total
Significantly reduced functioning (excluding people with a psychiatric disability)	68-169	116-285	101-254	285-708
Early intervention	2-4	29-73	16-39	46-116
Total	70-173	144-358	117-292	331-824

Source: Productivity Commission, *Disability Care and Support, Inquiry Report*

¹⁸ Disability Care and Support, Productivity Commission Inquiry Report, 2011.



Table 3: Source: Productivity Commission, Disability Care and Support, Inquiry Report

	0-14 years	14-49 years	50-64 years	Total
Significantly reduced functioning (excluding people with a psychiatric disability)	9-28	21-62	21-62	51-152
Early intervention	0	3-8	6-17	8-25
Total	9-28	23-70	26-79	59-177

Source: Productivity Commission, Disability Care and Support, Inquiry Report

The work of the Productivity Commission and the previous surveys and reports that contributed to their estimates, along with ABS demographic data, form a useful and accessible foundation for estimating similar parameters for the use of AT in Australia by all persons. Estimates from these sources can be enhanced and extended using the additional methods discussed below.

AITI has sourced data from Disability SA on its annual purchases of AT on behalf of people with a disability. In 2013-14 DSA spent \$8.9 million on AT products. Of this, around \$5.3 million could be considered 'medium to complex'. An important point to note here is that AT products for people with a disability are more likely to be toward the complex and customised end of the AT spectrum than those supplied for aged persons. In a sense, AT for people with disabilities 'leads' AT for aged persons in terms of complexity.

As part of the NDIS policy development effort the Disability Policy and Research Working Group commissioned a 2012 paper that collected expenditures on AT by the main state and Federal disability agencies. Of the total of \$596.6 million about 30% is likely to be 'medium to complex' AT (based on estimated provided by DSA). The data on AT expenditure on disability by agencies is highly reliable because these organisations carefully monitor their expenditure levels. A summary of data from the various sources is provided in Table 4.

Table 4: Demand estimates: summary

Estimate	Value (\$)	Comments
Assistive technology imports 2011-12	600 million	All AT
Assistive technology exports 2011-12	500 million	All AT
'aids and equipment' for people with a disability	331-824 million	estimated by Productivity Commission under the NDIS
'home modifications' for people with a disability	59 – 177 million	estimated by Productivity Commission under the NDIS
Care organisation expenditure on AT for persons who are ageing	143 million	Based on SA data – not full coverage, pro rata by population to national estimate
Disability service agencies, annual expenditure 2010-11	596.6 million	All AT for people with a disability
Disability service agencies, annual expenditure 2010-11 (medium to complex AT)	218 million	Estimated medium complexity to complex AT based on 36% of total estimate from DSA



For an additional perspective on the data, the Assistive Technologies Suppliers Association was consulted. ATSA pointed out that approximately 70% of AT purchases were privately funded. Their work on estimating AT sales in Australia is provided in Table 5.

Table 5: Summary: National Expenditure on Assistive Technologies

Major Areas of Expenditure	Program	Expenditure (\$M)	Financial Year(s)
Government Disability	State/territory aids & equipment programs, plus Commonwealth employment and education programs, and continence assistance	471	2006-2009
Government Health	Hospital Discharge and health insurance premiums	479	2007-2008
Government Aged Care	EACH, EACH-D, HACC (home mods), & DVA	27	2008-2010
Total Government		977	27% of total expenditure
Individuals/Households	Personal expenditure	2264	2007-2008
Insurance	Private Health Insurance	325	2007-2008
Insurance	Workers Compensation and Compulsory Third Party Traffic Accident Insurance	45	2007-2008
Charitable	Philanthropic & NGO	unknown	This is one of the largest of many unknown areas of expenditure
Total Non-Government		2,634	73% of total expenditure
National Annual Total		3,611	

The national annual total of around \$3.6 billion is based on data for the period 2000-2008 and therefore is somewhat dated for our purposes. It does, however, give an indication that the total level of AT expenditure exceeds government expenditure on AT by a large margin and suggests that in 2014 AT expenditure in Australia is likely to be well in excess of \$4 billion per year.

Once again, this links to the observation of the impact and influence of higher income family units (alongside governments and public bodies) in creating demand for AT. Many AT products and services, at the medium- to high-complexity levels, exhibit high income elasticities of demand, meaning that the demand for them increases as income grows, but at a faster rate than the growth in income.



Inputs from industry participants suggest that medium to high complexity AT makes up around 30% of the expenditure of disability agencies around Australia. If it is characteristic of total AT expenditure in Australia, then medium to high complexity AT would be at around \$1.3 billion. It may be that expenditure on AT for aged care is characterised by a lower level of medium to high complexity AT than that for disability care. This could be expected to change as the size of the market for aged care AT increases, technologies improve and the requirements of aged persons increase in sophistication.

5.2 Forecasting future levels of AT demand

The future demand for AT will be driven by several main factors, including:

- Increases in the relative and/or absolute size of the population using AT, that is, demographic drivers
- Changes in technology that enable superior AT solutions to be delivered to the market
- Increases in the capacity of aged persons to fund more sophisticated AT purchases –the currently retiring generation in advanced western countries will be the most well-resourced of any retiring generation in history
- Increases in funding available for persons with a disability – in many countries new policies and programs are being launched to enable persons with a disability to access improved products and services, for example, the Australian NDIS
- Changes in the preferences and purchasing behaviour of purchasers of AT products. This factor is interdependent with some of the factors listed above, but education and awareness-raising is likely to contribute to higher levels of AT purchases in the future.

Of all these factors the most straightforward to forecast are demographic drivers. Technological change is inherently unpredictable and is closely linked with innovation more generally, including innovation in business model design. The future path of preferences and behaviours are also difficult to predict and although the increased wealth of retirees is relatively predictable it is uncertain to what extent resources will be directed at AT. Therefore, the rest of this section focuses on the demographic drivers in an effort to develop a picture of the way in which the market size for AT is likely to change over the next decade.

5.2.1 Current demographic trends

In 2012, the Australian population was 22.7 million. Older age groups (i.e. 60 years and older) totaled over 4.4 million or 20% of the population. More than 18%, or nearly 4.2 million, had a disability with older age groups most affected (see Table 6). Therefore, factoring in *all* older individuals (i.e. 60 years and older), some of whom require the support needs associated with 'normal' ageing and some of whom have greater needs due to disability (n= 4,445,247), in addition to younger people who have a disability (n= 2,095,161), the current population that might use assistive technologies is approximately 29% or 6.5 million.



Table 6: Australian population with a disability¹⁹ by age group, 2012

Age (years)	Population		With disability	
	N	%	N	%
0-4	1 480 134	6.5	53 285	3.6
5-14	2 810 089	12.4	247 288	8.8
15-24	3 081 547	13.6	240 361	7.8
25-34	3 280 286	14.4	285 385	8.7
35-44	3 189 476	14.0	363 600	11.4
45-54	3 054 940	13.4	552 944	18.1
55-59	1 365 498	6.0	352 299	25.8
60-64	1 224 112	5.4	401 509	32.8
65-69	1 024 571	4.5	404 706	39.5
70-74	755 799	3.3	334 063	44.2
75-79	572 204	2.5	318 145	55.6
80-84	444 567	2.0	296 082	66.6
85 and over [^]	423 994	1.9	348 947	82.3
ALL	22 707 217	99.9	4 198 613	18.5

Source: ABS Population by Age and Sex, Regions of Australia, 2012 (cat. no. 3235.0) and Disability, Ageing and Carers, Australia: Summary of Findings, 2012 (cat. no. 4430.0).

Note, rounding errors may occur.

[^]Used average percentage prevalence of 85-89 and 90+ age groups because population ERPs were not provided for the 90+ category.

The degree of disability, or more specifically activity limitation²⁰, also increases with age. Less than 10% of age groups 65-69 years and younger have a profound or severe core activity limitation compared to more than one quarter of those aged 80-84 (see Table 7). Rates of moderate or mild limitations show a more gradual increase with age. Almost one quarter of 65-69 year olds have a moderate or mild limitation, increasing to one third of those aged 75-79 and 80-84. Note individual population data were not available for the last two age groups so proportions could not be calculated.

¹⁹ The term 'Disability' includes impairments, activity limitations and participation restrictions, as influenced by environmental factors. See www.nds.org.au/asset/view_document/979316292.

²⁰ There are four levels of activity restrictions: Profound – unable to perform a core activity or always needing assistance; Severe – sometimes needing assistance to perform a core activity; Moderate – not needing assistance, but having difficulty performing a core activity; and Mild – having no difficulty performing a core activity but using aids or equipment because of disability. Core activities are those around self-care, mobility and communication. Also see www.nds.org.au/asset/view_document/979316292.



Table 7: Degree of activity limitation by age group, 2012

Age (years)	Population	Profound or Severe core activity limitation		Moderate or Mild core activity limitation	
		Estimate ('000)	% of population	Estimate ('000)	% of population
0-4	1 480 134	34.9	2.4	1.3	0.1
5-14	2 810 089	133.8	4.8	55.0	2.0
15-24	3 081 547	67.9	2.2	85.3	2.8
25-34	3 280 286	68.6	2.1	118.6	3.6
35-44	3 189 476	92.2	2.9	155.9	4.9
45-54	3 054 940	135.4	4.4	273.2	8.9
55-59	1 365 498	83.2	6.1	191.9	14.1
60-64	1 224 112	107.7	8.8	231.2	18.9
65-69	1 024 571	99.4	9.7	242.6	23.7
70-74	755 799	93.4	12.4	210.2	27.8
75-79	572 204	105.9	18.5	190.0	33.2
80-84	444 567	132.4	29.8	153.8	34.6
85-89	Not provided	130.6	N/A	88.0	N/A
90 and over	Not provided	101.0	N/A	26.8	N/A
ALL		1 391.5	6.1	2 021.1	8.9

Source Table 3_1 'All persons, Disability status, by age and sex – 2012'. From ABS Disability, Ageing and Carers, Australia: Summary of Findings, 2012 (cat. no. 4430.0).

Please refer to ABS for relative standard error (RSE) information about the estimates.

Note, rounding errors may occur.

In terms of variation in activity limitations across Australia, several states have around 6% of their population having a profound or severe limitation (see Table 8). Tasmania has the highest proportion of people with profound or severe limitation and Northern Territory the least (although NT figures should be used cautiously due to high Relative Standard Error (RSE) estimates; see the Australian Bureau of Statistics for more information about RSE). For moderate or mild limitations, Tasmania was again highest ranking with 12% of their population afflicted. South Australia was a close second at 11% of their population, a fact linked clearly to this state's higher age profile.



Table 8: Degree of disability limitation by state and territory, 2012

State or Territory	Population	Profound or Severe core activity limitation		Moderate or Mild core activity limitation	
		Estimate ('000)	% of population	Estimate ('000)	% of population
South Australia	1 656 299	93.5	5.6	177.3	10.7
New South Wales	7 301 134	419.5	5.7	637.4	8.7
Victoria	5 629 122	311.9	5.5	513.4	9.1
Queensland	4 565 529	236.2	5.2	401.7	8.8
Western Australia	2 432 706	89.2	3.7	189.0	7.8
Tasmania	512 333	34.4	6.7	61.0	11.9
Northern Territory	235 182	5.1	2.2	9.2	3.9
Australian Capital Territory	374 912	17.3	4.6	25.3	6.7
ALL	22 707 217	1 212.4	6.1	2 015.1	8.9

Source: Table 5_1 'All persons, living in households, Disability status, by age, by sex and geographic location – 2012'. From ABS Disability, Ageing and Carers, Australia: Summary of Findings, 2012 (cat. no. 4430.0). Please refer to ABS for relative standard error (RSE) information about the estimates.

Note, rounding errors may occur.

5.2.2 Future demand

Based on population projections conducted by the ABS, older age groups will account for an increasing proportion of the population (see Table 9). Compared to 2012, where 20% of the population (4.4 million) was aged 60 years and older, this group will increase to 23% of the population (6.4 million) in 2025, 27% (10 million) in 2050 and 30% (16 million) in 2100. This is more than a doubling in the number of older Australians in a little more than a decade. In particular, there will also be a doubling in the proportion of Australians aged 85 years or older from 1.9% in 2012 to 4.2% in 2050.

Associated with this ageing population is an increase in degree of activity limitation with several sources indicating a doubling or trebling of people in the profound or severe core activity limitation group in the decades to come (e.g. population projections by the ABS²¹; Giles et al., 2003²²). For example, according to a report about disability expectations by PricewaterhouseCoopers (2011, p. 9²³):

In 2099, it is estimated that approximately 4 million people will have a severe/profound core activity limitation in Australia – more than triple the current number. However, the Australian population is estimated only to double over this same time period; hence, it is likely that the same amount of

²¹ ABS Population Projections, Australia, 2012 (cat. No. 3222.0).

²² Giles, L., Cameron, I.D. & Crotty, M (2003). Disability in older Australians: projections for 2006-2031. *MJA*, 179, 130-133.

²³ Disability expectations. Investing in a better life, a stronger Australia. Achieving better outcomes for people with a disability and their families, November 2011. PricewaterhouseCoopers (PwC), Australia.



informal care will not be available in the future to support people with disabilities. The formal workforce will need to grow significantly to meet this increasing demand.

Table 9: Population Projection* for Australia

Age (years)	Population projection for year					
	2025		2050		2100	
	N	%	N	%	N	%
0-4	1 760 252	6.3	2 167 924	5.8	2 850 541	5.3
5-14	3 512 620	12.5	4 275 870	11.4	5 771 805	10.8
15-24	3 440 499	12.2	4 398 833	11.7	5 994 189	11.2
25-34	3 901 975	13.9	4 935 341	13.1	6 431 974	12.1
35-44	4 018 411	14.3	4 952 218	13.2	6 599 524	12.4
45-54	3 449 462	12.3	4 607 778	12.3	6 497 691	12.2
55-59	1 589 817	5.7	2 244 195	6.0	3 103 106	5.8
60-64	1 545 179	5.5	2 154 754	5.7	2 968 284	5.6
65-69	1 403 100	5.0	1 953 478	5.2	2 826 350	5.3
70-74	1 194 734	4.3	1 620 580	4.3	2 670 670	5.0
75-79	1 004 038	3.6	1 505 959	4.0	2 471 209	4.6
80-84	662 489	2.4	1 210 877	3.2	2 133 482	4.0
85 and over [^]	616 697	2.2	1 565 829	4.2	2 978 548	5.6
ALL	28 099 273	100.2	37 593 636	100.1	53 297 373	99.9

Source: ABS, *Population Projections, Australia, 2012 (cat. No. 3222.0)*.

**Population projections are based on assumptions of future levels of fertility, life expectancy and migration, which are guided by recent population trends. To simplify the analysis, Series B has been chosen. Refer to ABS for more details.*

Note, rounding errors may occur.

What emerges from consideration of demographic trends is rapid growth in the groups that are most likely to demand AT. The number of aged persons will more than double in just over a decade (and another doubling by 2050). In addition, however, this group will be significantly better funded than previous generations of the aged²⁴. They are likely to be healthier and aspire to more active retirements than previous generations. They will also have access to superior technologies than previous generations. Taken together, these factors are likely to drive very rapid growth of demand for AT for the next three decades at least.

In order to evaluate opportunities in AT for South Australian manufacturers, it is necessary to evaluate, in the context of this general growth in demand for AT products and services, more specific product and service opportunities. In the next two Sections we consider the Demand/Supply/Capability (DSC) approach and the inputs from Fraunhofer that will enable us to

²⁴ ABS Survey of Disability, Ageing and Carers, 2009



define more specific product categories that may represent opportunities for South Australian manufacturers.



6 AT Industry Development – A European Perspective

6.1 Introduction

Deep and pervasive demographic, social and economic changes at work in Europe, are leading to new commercial opportunities and to the emergence of industries that will provide products and services to Europe's growing aged population. Analysis provided by Fraunhofer helps us to identify complex and interrelated trends that are feeding into these new opportunities.²⁵ It is only to be expected, of course, that in certain areas there will be issues of relevance and translation for application to South Australia. The report provides sufficient detail to define similarities and differences, whilst providing also the latest information on trends and prospective opportunities with potential benefits to South Australia. These trends are analysed using a 'trend radar' approach. Two types of radar are deployed: an Environmental Trend Radar and a Technology Trend Radar.

Of course, the overarching trends, as discussed elsewhere, are the confluence of:

- Higher incomes in advanced societies generally and amongst older persons particularly, with
- Growing technological sophistication and diversity of products to assist older persons and those with a disability, with
- Rising costs of increased aging (and associated rising disability rates), causing
- An imperative for sustained productivity improvement and innovation across the health and care systems, reinforcing
- The productivity improving potential of assistive technologies.

Fraunhofer-identified trends that sit below (and are consequence of) this confluence of major trends are:

- Society: this includes changes in family structures such as the emergence of multigenerational households, the development of new kinds of communities for the elderly and responses to the problems of isolation and loneliness among elderly people
- People in need of care: responses to the need to manage chronic illnesses and long-term disabilities, and neuropsychiatric diseases and the need to empower people in the ongoing care
- Care providers: emerging models for care provision including community oriented care groups, home-based care emphasising independence, labour and skill shortages in the care sector
- Politics and Legislation: changes in policy for disability care and aged person care (in Australia, for example, the NDIS and consumer directed care for the aged), changes in public procurement of AT, education and awareness raising for AT products and services and the development of AT markets
- Education: training and qualifications with carers, innovation and training for AT products and solutions driving the development of more academic research, training and qualifications in AT particularly in the areas of high technology AT.

²⁵ Assistive Technologies: European Trends and Opportunities, the companion volume to this report, available at www.flinders.edu.au/aiti

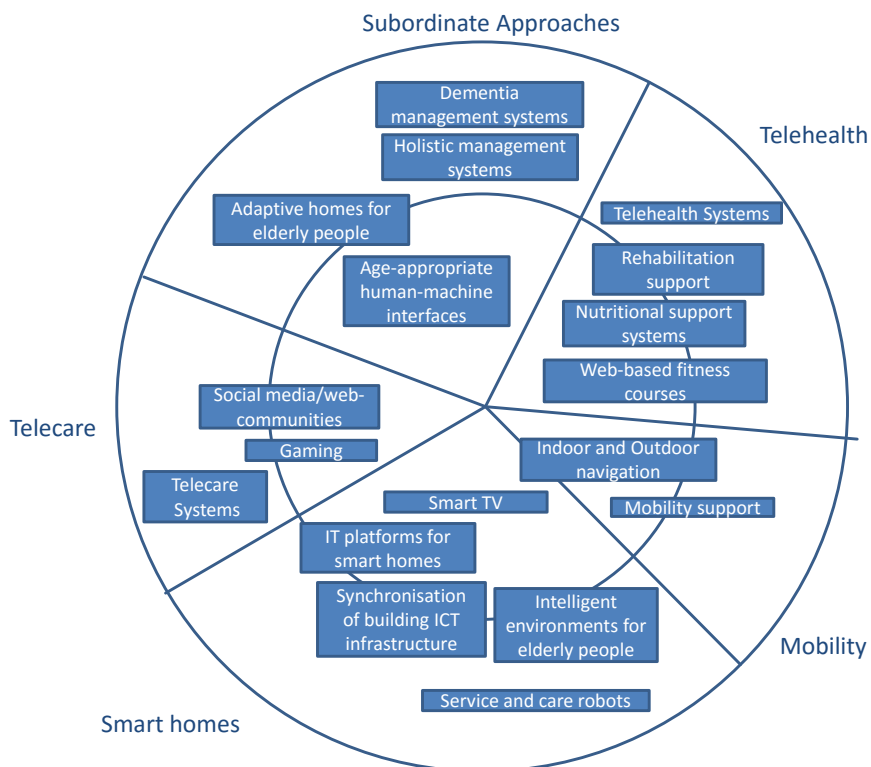


The Environmental Radar describes how changes in various areas are likely to influence the development of AT markets.

Figure 8: Environmental Radar



Figure 9: Technology Radar



The Technology Trend Radar identifies four main high-level areas of technological change likely to impact on AT markets:

- Telecare Systems
- Telehealth
- Smart homes
- Mobility.

As can be seen from the diagram, within each of the four categories of technological change, there are multiple more specific opportunities identified such as 'IT platforms for smart homes', 'rehabilitation support' etc. Each of these areas is rated in Fraunhofer's report for 'Opportunity', 'Challenges' and 'Relevance' in relation to SMEs that have an interest in participating in various sectors of the AT market. The following extract provides an example of this coverage in relation to the category 'mobility support'.

Mobility support

Independent life is only possible if mobility is given. This includes rollators with improved comfort and design such as break assistants, electrical drives or integrated tablets for navigation but also future visions such as self-driving cars. Furthermore, advanced driver assistance systems (e.g. parking assistants) will support elderly people in the future if designed towards their needs.

Other activities focus on assisting elderly people in their travel planning with public transport (e.g. route planning, time planning or ticket purchasing) (compare Levin 2012).

Related DIN EN ISO 9999-2011 categories:

12 Assistive products for personal mobility

22 Assistive products for communication and information



Image 1:
E-buddy
(<http://www.my-ebuddy.com/>) /
Boomer
(www.tuvie.com)

Assessment

Opportunities

- high
 medium
 low

- Most promising for SMEs in the context of mobility seems the development and production of re-designed rollators, wheelchairs or comparable devices. New designs and functions can be integrated into these systems without capital-intensive investments. ICT platforms or driver assistance systems are functionalities that will be developed by large OEMs and software companies.



Challenges	<input checked="" type="checkbox"/> high <input type="checkbox"/> medium <input type="checkbox"/> low	<ul style="list-style-type: none"> Rollators and other mobility devices will combine different kinds of material in the future (metal, polymers and other light-weight materials), mechatronic components, electrical drive systems and electronic devices. The challenge for SMEs is to integrate all these components and to offer a well-designed solution to the end-user. Business models should include life-time support (i.e. services such as maintenance, battery replacement).
<hr/>		
Relevance	<input checked="" type="checkbox"/> short-term (< 5 yrs) (integration of new materials and functionalities into wheelchairs, rollators, or passenger cars; development of platforms that support travel planning) <input checked="" type="checkbox"/> medium-term (5-10 yrs) (smart passenger cars (self-driving cars are not expected in the next ten years))	
<hr/>		

The analysis in the case of mobility support is quite positive in terms of opportunities for SMEs. By contrast, in some of the other categories relatively large players already have dominant positions even though markets are still emerging. An example of such a case is in the application of smart TV technology to aged care. The large and established producers of smart TV can be expected to dominate as this market develops into the aged care niche and new entrants would find such players very difficult to compete with. Mobility support, however, is characterised by significant differentiation and measures, the relatively rapid development of new technologies and significantly smaller economies of scale in production and distribution. In addition, ongoing life-cycle support for products is very important in this segment and such support will need to be delivered locally.

6.2 Insights from International AT experts

As part of the ATMO project, Fraunhofer IAO conducted interviews with five German experts in the AT field spanning users, care organisations, researchers and manufacturers. The following provides a summary of the interviews.

Personal biosensors for the elderly and the services that monitor bio data and provide support services will be important. Such devices are under development by multiple providers but the market is not yet mature and standards are yet to be developed. There are substantial opportunities in smart homes and building automation particularly that which includes bio sensing and messaging systems. The need is for modular solutions that are easily extendable and upgradable. It is important that technology is aesthetically appropriate and is not perceived as specifically for older persons or persons with a disability.

The market is nascent, there are many prototypes but companies are reluctant to be pioneers in the AT market. The newness and uncertainty surrounding AT markets, the low scale of visual offerings and associated high prices represent a risk to potential suppliers. There are many putative systems, solutions and standards but these are far from settled and the market can be expected to be highly contested as the aged demographic increases in size rapidly. There will be strong competition for standards and potential AT producers need to consider a systems



approach to markets that emphasises intra-operability and integration across multiple products and systems.

In addition to smart phones, smart watches and other wearable computing and sensor devices will become increasingly relevant. Key drivers are miniaturisation and interconnection of products. These products will offer navigation support, assistance with shopping and biometric data will be transmitted to expert systems providing support with medical analysis and medication.

Care providers need to adopt new technologies to meet the expectations and care requirements of large numbers of older persons. The cost of personal care provision will be prohibitive and electronic solutions for monitoring and management of aged persons will be essential to maximise independence and optimise personal care provision. Home automation is a key direction and maintaining use of private cars through car modifications is also important. Ongoing support and maintenance of IT solutions will be critical.

The area described as Ambient Assisted Living (AAL) will be an important new field of business. The idea was expressed that there is currently an 'innovation backlog' in AAL, meaning that there is much research activity but not yet a real market – there are many 'puzzle parts' but no whole integrated solutions.

In general, the AAL market provides opportunities for many new market entrants. One important precondition is that companies are willing to find suitable partners. Networking is highly advisable in any case, since new participants should focus on their core competencies and cover all other challenges through cooperation.

There is a need for extensive end user participation in design and development. At the same time, however, there is a need for innovation and entrepreneurial activity on the part of AT product and service providers. Henry Ford's famous quote was cited: "If I had asked my customers what they wanted, then they would have said a faster horse." While a high level of awareness of user needs through user testing is critical, the most successful products will be those based on innovative leaps and insights as well. Often it will be necessary for companies to create awareness for the value of an innovative product in order to cultivate adoption.

Producers of AT products and systems will need to incorporate leading edge technologies to achieve market penetration and will therefore will need to collaborate with research organisations if they are not able to generate new technologies internally. Producers need to see themselves as situated within manufacturing and production ecosystems, understand their position in supply chains and develop strategic collaborative partnerships accordingly.

The challenges to companies wishing to enter AT markets include potential legal and regulatory hurdles. Funding production and sales of AT products is likely to involve demonstration of benefits to multiple stakeholders with contributions from each commensurate with benefits delivered.

Producers will need to develop a clear understanding of how AT is marketed and sold, in particular, whether particular classes of products are more likely to be purchased by care organisations or by individuals and orient their marketing and sales efforts accordingly. Such considerations will include a focus on whole-of-life product and service bundles that need to be the focus of AT vendors for more complex and sophisticated offerings and consumers will demand reliability and continuity of services.



7 AT Industry Development Opportunities

7.1 Global Insights

Recognising that much can be learnt from international experience in the development of a flourishing AT sector, this project has drawn on the considerable industry intelligence available from Fraunhofer IAO. Fraunhofer's analysis for the project focuses on the opportunities in AT for SMEs and it therefore takes into account, not only the likely demand for particular AT categories, but also on market structure on the supply side of these categories. For example, a particular product category is unlikely to be an opportunity for an SME if that product category is already dominated by a few very large players. Based on this analysis, Fraunhofer has identified the following as the main areas of opportunity:

- Social media/web-communities – communications with carers and friends for well-being, care and social interaction. High value opportunity to provide functionality to established platforms for tele care, etc.
- Indoor and outdoor navigation – lights and sensors, including GPS, for indoor and outdoor navigation
- Holistic management systems – further integration and expansion of tele care and telehealth services for ease of living and functionality, with SME potential involvement in some hardware or software building blocks (provided functional integration can be achieved)
- Web-based fitness programmes/courses and empowerment – patient training modules seen as highest opportunity
- Telecare/telehealth systems – sensors and devices, often integrated into smart homes to provide home-based care, with subsystems the focus for SMEs
- Service and care robots – a number have been prototyped, produced or are in development for use as in-home aids and quasi-carers. They can replace or complement expensive building and room equipment, as well as the cost of carers. These are highly complex, so the challenges to entry by SMEs are high, although the market is not fully occupied by strong incumbents. The SME opportunities are in contributing special equipment and additional functionalities
- Mobility support – this is principally enhanced rollators, frames and wheelchairs and comparable devices, ahead of the advent of driverless vehicles. These mobility devices involve ICT systems, electronics, and mechatronics, as well as new, lightweight materials. The challenge and opportunity for SMEs is integration of the various components into a well-designed solution, and service bundling (e.g., maintenance and battery replacement)
- Smart TV – this will become the control and communications interface in the home for the range of services described in this section, with the SME opportunities in software applications (currently with low barriers to entry)
- Gaming – highest opportunity for SMEs seen as health and rehabilitation “but deep medical and biomechanical know-how is necessary for the development of products”
- Nutritional support systems – patient surveys to advise on daily nutrition and exercise, e.g., avoiding dehydration, with SME opportunities in software or specific hardware (provided integration into wider systems can be achieved).



It is important to emphasise that, while the opportunities above have been identified as appropriate for SMEs, there are significant differences between German SMEs and Australian SMEs. In particular, German SMEs tend to be larger and, on average, more technologically advanced than Australian SMEs. They are also more likely to be well integrated into larger industrial networks and supply chains that enable higher levels of specialisation and niching, as well as deeper involvement in research partnerships to develop new products, etc.

It is also noteworthy that the opportunities listed above are characterised by bundling and combinations of manufactured products with service offerings. The opportunities are also based on the development and deployment of relatively advanced technologies and emphasise integration of products and services with existing systems and value chains. These characteristics reveal that, to be successful, SMEs will need to collaborate with each other and be able to develop relatively advanced technologies or cooperate with organisations that can.

This relates to analysis and recommendations made elsewhere in this report concerning living laboratories.

7.2 Perspectives from care organisations and others

Various local care providers and opinion leaders in the field have expressed views to the project about particular areas of demand that may be the source of various local industry opportunities.

These are:

- Physical training/fitness/rehabilitation equipment – this reflects a changing philosophy concerning care, ageing and disability, in which the objective is to maximise recovery and independent living over permanent care
- Assisted mobility products – greater integration of these electronic functions, circuits, etc., for beds, lifters and other pressure care equipment
- Global positioning systems, increased use of gaming technology, greater need for alarms and security devices, telehealth and tele-med apps for ‘mind and body’, self-diagnosis, etc.
- Systems or packages that contribute to sustainability values for older persons living at home, such as energy and water efficiency and conservation
- Lifting and related equipment.

A Demand Side Forum convened by the project, consisting of care and service organisations, an importer of AT, an AT start up and an AT procurement manager for the South Australian government, also provided guidance on which of the Fraunhofer-identified opportunity areas represented high value, realistic options in the South Australian context.

The importance of conducting examination from this angle is not only to better appreciate the extent of growth in demand for assistive technologies overall, as well as the dimensions of demand for particular product classes. It is also to understand the potential of these organisations to act as lead customers for key products and services by stimulating local innovation. To play such a role, the organisations, together with individual users of AT themselves, must deepen their knowledge of the range of potential applications of AT in real settings.

This was revealed at the Demand Side Forum. All participants recognised that the significance of AT will grow. Care organisations will be focused on “accessible technology at affordable prices”



and they will need to be cognisant of the implications for their own business models and business processes of increasing adoption of AT, for example, the need for life-cycle support.

While the care organisations are aware that AT is central to keeping the elderly independent and in their homes, they are aware that they do not have a well-developed understanding of how AT products and services can be best utilised to this end. There is a strong view that research is required to understand how the use of AT in actual home settings can shape and improve the care model for these organisations and outcomes for users. The group acknowledged that a Living Lab or Co-design centre approach would be an appropriate way to approach this problem.

Related to this point, there is little understanding among the aged themselves of AT options and care organisations are well placed to play a leading role in an education and awareness raising process. Having said this, there is likelihood that the boomer retirees will be much better informed as they have been more technologically literate in their working lives. This is likely to translate into a better capacity to research and assess AT options.

It was agreed that dementia will be an area of great concern and focus for governments and care organisations and AT solutions that can assist with the management of this condition will be highly sought after.

There will also be a strong focus on fitness, well-being and rehabilitation. There is likely to be demand for fitness equipment and web-based programs tailored to the needs of the aged, and this equipment may be integrated with various types of sensors which will contribute to the remote monitoring of activity. All of these products will need to be supplied, installed, set up and maintained therefore presenting opportunities for local suppliers.

Biometric and activity monitoring systems will be naturally complemented by telehealth services and opportunities will exist for providers to integrate information across these sensing and telehealth systems and manage the associated data efficiently and securely.

It is important to recognise that persons with disabilities, particularly relatively severe disabilities, will be at the leading edge of AT products and solutions. The rollout of the NDIS will see a large increase in funding available for AT for persons with a disability. There is already a pressing need for skills and people to service, maintain and upgrade high end AT equipment for persons with disabilities. These solutions will include systems and interfaces to enable persons with disabilities to manage smart home systems. These management interfaces will be likely built into mobility equipment and innovations in this field are likely to have applications in AT for aged persons.

The group noted that the current generation of retirees is significantly challenged by medium to high complexity AT equipment and interfaces, but that they are likely to be the last generation for whom this is a barrier to the use of more advanced technologies. Currently retiring baby boomers, and those who follow them, will have significantly higher levels of technological literacy and will be more motivated to master sophisticated assistive technologies where these can enable significant positive lifestyle impacts.

Building these technologies into the home will be a significant and ongoing task. Similar to the way in which households have incorporated information technology systems and are now incorporating energy generation and management systems, AT systems will be deployed and integrated. The view was expressed that many retirees will have an intrinsic interest in installing, modifying and optimising these systems. Another source of activity will be modifications to motor



vehicles. These activities will be undertaken by local suppliers, although on current trends much of these systems and technologies will be imported.

The Demand Group was asked to rate the opportunities identified by Fraunhofer, as well as opportunities earlier suggested in discussions with care organisations. These perspectives are brought together in



Table 10.

7.3 SA Company Perspectives

To further test out the ratings provided above and identify issues of strategic significance for the development of a thriving AT industry in South Australia, selected interviews were undertaken with six companies including an automotive components manufacturer, an importer and manufacturer of relatively simple AT (looking to partner to produce more complex goods), a small manufacturer of relatively simple AT, a small SME with systems and systems integration expertise and a larger SME with similar areas of competence, and a larger company with a national presence.

Key insights from the companies interviewed include:

- Both within companies involved in the production of AT, and amongst manufacturing companies currently outside the AT sector, strong capabilities exist that are relevant to sustaining competitive advantage in AT, such as: high materials sciences, automation, systems integration, and process engineering capabilities. The local industry is highly capable in the development of flexible, easy-to-use and low cost solutions – this is where the key opportunities lie, including in integration
- Being good at low cost integrated solutions is an advantage local companies should be able to leverage, especially given that the main competition at this level will come from high cost nations
- Each company expressed strong interest in diversification into (or expansion of their role in) AT if the conditions were right
- There were strong and realistic opportunities for local industry participation in the AT value chain and development of local AT clusters
- Some of the best opportunities are in systems and systems integration, provided there is proper access to third party products and open platforms
- However, an alternative view was expressed about the desirability of a combination of open source software with proprietary sources
- ‘Plug and play’ solutions can be employed to achieve compatibility of different software systems between various hospitals and care organisations
- Lack of capital remains a major impediment, with some expressing hope that initiatives such as the state’s recent announcement of a new body focused on investment attraction, with a focus on job creation and drawing on the experiences of such nations as Singapore and Ireland, could help
- The need to support development of locally grown IP and proprietary technology, to maximise value and opportunities for service-bundling, together with rapid adaptation
- The local industry has strengths in customisation and high quality standards
- Concerns exist about the loss of local companies supplying key componentry and materials, such as motors and stainless steel, causing longer lead times, the requirement to place large orders, and uncertain quality
- The NBN roll-out should be used to assist the growth of the local industry
- Government procurement and tendering processes need to be reformed to provide greater openness to local SMEs, and should reflect best international practice by seeking



explicitly to stimulate innovation by local companies and highly capable local clusters, as a component of 'value for money' criteria

- Partnerships and collaboration are critical to rapid industry diversification and new product development
- The capacities of South Australian companies appear to be broad rather than deep. There are not the dense clusters in existence that elsewhere support new product development. Partnerships, including with overseas firms, are essential
- As an extension of this, an explicit government commitment to AT as an industry development and diversification opportunity and focus area would be highly valuable. An analogue to the defence procurement 'White Paper' process for AT was suggested
- Pathways to market and the role of lead customers were of capital importance as levers for rapid industry development. These take several potential forms:
 - Aggregating demand for common items across care organisations where possible, as well as with government purchasing authorities
 - Leveraging demand from trusted large service organisations such as the RAA, adaptable infrastructure and a desire to expand their service offerings to their large membership
 - Leveraging, where possible, the market reach of retail and wholesale importing organisations with an interest in branding their own products or otherwise supplementing their range with locally produced items.
- Rapidity to market was as fundamental as having defined and robust paths to market
- Related to paths and rapidity to market, a push should be initiated to recruit larger companies with global reach to mentor local SMEs and assist in their gaining access to global niches
- Living laboratories and co-design principles were seen as having merit in bringing users, care organisations, manufacturers and researchers into alignment and collaborative arrangements to exchange knowledge and accelerate development of new products.

Table 10 provides responses of the manufacturers interviewed to the Fraunhofer and care organization-identified opportunities. A high level of concordance (but not unanimity) is observable, giving confidence in the opportunity areas nominated, with further investigation, and greater precision, required. In addition, companies indicated work they were undertaking to enter new AT markets which cannot be reported here, as they are commercial in confidence. However, they covered the broad areas of building and home facilities, mobility and lifting equipment, and home systems and systems integration.



Table 10: Ratings of opportunities by manufacturers

Opportunity	Rating by manufacturers
FRAUNHOFER OPPORTUNITIES	
Social media/web-communities	Medium
Indoor and outdoor navigation	High
Holistic management systems	High
Web-based fitness programs/courses and empowerment	Medium
Telecare/telehealth systems	High
Service and care robots	No
Mobility support	High
Smart TV	Medium
Nutritional support systems	High
CARE ORGANISATION OPPORTUNITIES	
Physical training/fitness/rehabilitation equipment	Medium-High
Assisted mobility products	High
Global positioning systems, gaming technology, alarms and security devices, telehealth and tele-med apps	High
Systems and packages for energy and water conservation and efficiency.	High
Lifting and safety equipment, beds	High

The synthesis of opportunities provided in the report provides a foundation for a more strategic approach to AT product and service development involving producers, users, researchers and policy makers. We will explore mechanisms for enabling this process to be undertaken in a systematic fashion in sections 9 and 10 of the report.



8 SA Manufacturers and AT Industry Development

8.1 Introduction

Assessment of the capabilities of local companies is essential to pinpointing practical, high-value actionable opportunities for South Australian industry diversification. Having surveyed the quantitative and qualitative dimensions of demand for medium- to high-complexity AT in particular, together with the Fraunhofer environmental and technology trend radar analysis, local firm capabilities and capacities need to be analysed.

This is to gauge the nature and extent to which local firms are, or may become, capable of participating in various AT opportunities. Only where our companies have capacity and capability aligned to the requirements of successful competition and innovation in particular areas of AT is there an opportunity for local industry development or diversification.

Two broad categories of capacity and capability are referred to:

- Specific technical and organisational characteristics of the company or companies aligned to the requirements of AT, and
- Broader business model characteristics favourable to the overall requirements of medium- to high-complexity AT, such as agility between different product and market areas, etc.

Several elements and activities undertaken under the ATMO project allow the drawing of a 'composite picture' of these supply side characteristics and requirements against the existing features and capabilities of South Australian firms. The principal sources are:

- Assistive Technologies: Case studies into South Australian Automotive supplier readiness, November 2013 ²⁶
- The principal report and various additional inputs from Fraunhofer
- Various inputs from two industry workshops (April and October 2014)
- Various inputs from the ATMO project Industry Reference Group
- A November-December 2014 survey of South Australian manufacturers deemed to have possible interest
- Face to face discussions with a small number of manufacturing companies conducted in February-March 2015. These focussed particularly on the manufacturers' views on the attractiveness of the product categories nominated by Fraunhofer, and on their self-assessment of their capabilities to enter (or to expand their participation in) AT markets.

8.2 Assistive technologies: Automotive supplier readiness

The capacity and capability of automotive companies to effect a transition into AT markets was also the focus of the Assisting Transition project. This involved an in-depth investigation of five manufacturing businesses in the South Australian automotive components sector, selected to

²⁶ This was also summarised in Spoehr J, Worrall L, Sandercock P, Eyre J, Molloy S. 2014. *Assisting Transition: Assistive technologies opportunities and industrial transformation in South Australia*. Adelaide: Australian Workplace Innovation and Social Research Centre, The University of Adelaide



represent variations with respect to size, scale, location, specialisation, position within the automotive supply chain, and local versus foreign ownership. The study's purpose was to examine potential for companies to exit automotive and enter AT markets, utilizing technical and organizational capabilities acquired in the former.

Hence, the case studies highlighted potential strengths of the companies and existing capability gaps hindering participation in AT markets – simple, medium- and high-complexity – against 'critical success factors' for participation in AT markets.

The current capability level of most of the surveyed automotive component companies was found to be aligned to the simple AT end, the category that is most susceptible to low cost offshore competition.

Only one of the five companies studied was considered to have the capability to support complex AT production at this time, although the remainder demonstrated sufficient capability that might serve as a platform for growth into more complex AT production. These results are likely to be reflected more broadly across South Australian manufactures, and this is a reason why a strategy focused on value chain opportunities and enterprise improvement is needed to capture opportunities.

It was found that the companies had the following **strengths** pertinent to complex AT production:

- A favourable and cooperative industrial relations climate
- Ability to adapt quality systems to the requirements of this value chain, and with several automotive companies having already implemented systems in support of future medical based product requirements
- Strengths in cash management necessary for future management of new project developments related to financial controls including cost controls, reporting, and KPI's, all of which were managed to a high standard
- Positive management attitudes to possibilities within the AT industry
- An understanding of the 'valley of death' issue associated with introduction of new technology.

The largest capability gaps exist in the areas of engineering and R&D, international business relationships, university partnerships and engagements, and the core process knowledge required to support the higher levels of complexity associated with complex AT products, as follows:

- Software design/development: none of the companies interviewed had in-house software design capability, possibly requiring joint venture or other commercial arrangements to support a transition to complex AT. Capabilities such as interface and cognitive design would require considerable improvement
- Understanding future training requirements: little knowledge exists and little attention is being given, to up skilling the workforce to accommodate future digital, electronic or other technological advancements
- Electronics: there is minimal complex electronics design and development capability amongst the automotive supply base. Most companies outsource this area, meaning that strong technical alliances would need to be developed to capture the new opportunities. Technical partnerships would be necessary to develop the high complexity electronics required for devices such as remote movement and control mechanisms



- Relationships with international offices or partners: to support advanced development of products or processes it is extremely beneficial to have value adding international connections. In general, companies would need to improve their participation in relevant networks for Complex AT production. Of the case studies, only two companies had formed alliances with relevant networks
- Additive manufacturing/3D printing: there is a reasonable level of 3D printing but, for the most part, it is for prototyping rather than production purposes, and uses older technology. Prototyping capability is strong, yet the level of additive manufacturing capability needed for complex implantable product, such as joint replacements, is significant
- Clean rooms: Adding to this issue is the absence of sterilisation and cleanroom capability within the sample set.

For the purposes of the subsequent discussion, it is necessary to recall that this survey of capability was restricted to a small number of automotive component suppliers only. The following discussion covers a broader cohort of local companies, with distinct conclusions being reached as a consequence.

8.3 Assistive technologies: South Australian manufacturer perspectives

An online survey of local manufacturing companies was conducted over November and December of 2014. The survey was despatched to 88 companies and a response rate of 20 percent (18 companies) was achieved. The survey questions covered broad company characteristics, situational awareness of, and involvement in, AT, and characteristics and capabilities companies require to enter new markets in general, and AT markets in particular. There is an inevitable degree of subjectivity in the survey responses. In addition, the moderate response rate and the spread of firms represented obviously limits valid inference from the survey. Nevertheless, results do provide a useful guide to the strengths and weaknesses of South Australian manufacturers from the view point of participation in medium- to high-complexity AT markets.

Key features of the responses are as follows:

- Almost half of respondents rated AT as highly attractive to their company. Companies expressing some interest but no current involvement in the assistive technologies market tended to be unsure of how attractive the market is. These present an opportunity for exploration, collaboration and information sharing. The three companies indicating the assistive technologies market is 'not attractive' come from a range of different sectors (including one involved in manufacturing medical devices)
- The majority of companies rated their 'capacity to understand their core competencies' and 'openness to new business opportunities' as 'strong' or 'very strong'. 'Capacity for strategic planning' and 'establishing and maintaining strong international business relationships' were also strengths for most companies. Similarly, a large proportion (61%) of companies also considered they were 'strong' or 'very strong' in the following abilities:
 - 'Translating new ideas into products'
 - 'Partnering with universities and other researchers' and
 - 'Understanding future trends and opportunities'.



- The area of greatest weakness was the ability to provide 'funding to invest in new products'
- Concerning specific company capabilities likely to be needed to enter AT markets, companies reported strength in the 'ability to meet external auditing assurance systems, regulations and standards', but significant weaknesses in 'accreditation for quality assurance systems' and the 'ability to use advanced techniques' (such as CNC and 3D printing). Less than a quarter were able to provide a certified clean room environment
- In addition to the weaknesses concerning access to capital, additional barriers to growth were the cost and time of regulatory requirements, and a lack of information on potential opportunities themselves
- Asked for their views on how they could better be supported to effect a transition to AT, companies cited greater information about consumer needs and the types of products required, and opportunities to network with clients and customers; better networking and collaboration between companies, mentoring and better access to universities for research collaboration.

Follow up interviews with selected companies were undertaken to test the findings of the industry case study report and the enterprise survey, and to obtain views on the applicability, relevance and attractiveness to South Australia of the Fraunhofer-identified SME opportunities, together with those identified by care organisations and others over the course of the ATMO project.

Briefly, the Fraunhofer-identified opportunity areas are, again:

- Social media/web-communities
- Indoor and outdoor navigation
- Holistic management systems
- Web-based fitness programmes/courses and
- Telecare/telehealth
- Service and care robots
- Mobility support, principally enhanced rollators, frames and wheelchairs and comparable devices
- Smart TV
- Nutritional support systems.

The care providers and opinion leaders identified areas of demand that may also be local industry opportunities, as follows:

- Physical training/fitness/rehabilitation equipment
- Assisted mobility
- Global positioning systems, increased use of gaming technology, greater need for alarms and security devices, telehealth and tele-med apps for 'mind and body', self-diagnosis, etc.
- Systems or packages that contribute to sustainability values for older persons living at home, such as energy and water efficiency and conservation
- Lifting and safety equipment, beds.

Note the considerable overlap within the Fraunhofer-nominated categories, and between this and the care provider-nominated areas. The high overlap within the Fraunhofer-nominated categories reflects the importance of systems integration to a wide array of AT applications at the medium-



to high-complexity level. This in turn suggests that it is precisely the development of these capabilities that will contribute most substantially to overall development of an AT sector in South Australia.

This is a point of strategic significance for policy to promote industry diversification. South Australian companies have strengths in systems and low-cost solutions. Alignment to the Fraunhofer and care sector-identified opportunities is therefore strong. These are capabilities with applications across a wide range of AT products. They are hence enablers for development of new products and deepening participation in the AT market. Strengthening these capabilities should be a key plank of the state's strategy.

It will be recalled that the Demand Side Forum, consisting of care and service organisations, an importer of AT, an AT start up and an AT procurement manager for the South Australian government, also provided guidance on which of the Fraunhofer-identified opportunity areas represented high value, realistic options in the South Australian context.

It should be noted that the evaluation of opportunities for local companies needs also to have regard to the broad contextual facts that:

- The opportunities for South Australia's SMEs in these areas (where these can be validated) will often be in componentry and sub-systems rather than in complete products, and/or in systems integration, involving some local production together with use of imported componentry, and
- Opportunities for local production may be enhanced where a distinctive product offering is bundled with a service offering.

The interviews also took full account of the results of the automotive case studies and survey reported above, particularly the capability gaps identified in the former (whilst recognizing that these focused on automotive component supplier readiness only). However, the key capability gaps identified in this cohort were, once again, in software design, training, electronics, underdevelopment of international linkages and partnerships, additive manufacturing as a production technique (as distinct from prototyping), and clean room capabilities, access to capital, market information, research relationships, etc.

The interviews elicited responses to questions such as:

- Which amongst the product areas cited above are realistic prospects for SA companies?
- Which are, and which are definitely not?
- Are there other areas of opportunity, and what are they?
- What capabilities are lacking, and would need to be acquired, to take up the specific opportunity?
- What are the key issues that would need to be addressed to take up the specific opportunities?
- What barriers would need to be addressed?
- What support would be of most value to exploring and capturing opportunities in assistive technologies?



9 Distilling industry development opportunities

In this section we distil a range of AT industry development opportunities. The product categories reported below are reliable target areas of high potential value. This assessment has been arrived at by triangulating and testing the various sources discussed above: Fraunhofer, industry opinion and sources, care organisations' opinions and survey responses, industry workshops, and so on.

The process has started with a broad range of potential AT targets, derived from desk top analysis, and narrowed through the Fraunhofer analysis. Then discussions with care organisations and others with knowledge of demand trends and local institutional and other conditions added target areas to the Fraunhofer ensemble, confirmed the high value and relevance of the majority of Fraunhofer's target opportunity areas, whilst deleting or demoting a small number of Fraunhofer's nominations. Then, this set was evaluated with local companies to test for relevance to South Australia's capabilities. An AT opportunity arises if, and only if, a high value area of demand growth aligns to local supply side capacity and scale: an opportunity is not actionable or realistic solely on account of being high growth nationally or internationally. Table 11 provides a distillation of the multiple perspectives on demand.

It is notable that, throughout, there has been a high level of concordance between the product class opportunities identified primarily by Fraunhofer and the views of the care and service organisations, and those of the local manufacturers. One product class from the Fraunhofer list has been eliminated (care and service robots) and a small number of others relegated to lower priority. But on the whole there has been a strong consensus that the majority of these areas represent solid opportunities.

Once again, the opportunities identified are at the product class – rather than individual product – level. This is a reflection of gaps in the data, as stated elsewhere, but it is also reflective of the fact that the main opportunities for SMEs will often be in componentry and sub-systems rather than in complete products, and, critically, in systems integration. Such integration tends to be product-nonspecific and high value, with applications in a range of areas. A co-design approach is likely to prove fruitful in the process of identifying specific product opportunities for development.

There is another qualification to the table, due again to gaps in the data. This is that because there are not values or rates of growth for the product categories, we are not able to include these as criteria for their ordering into a hierarchy of opportunities – rated against each other – but only to rate them discretely as high or medium level opportunities.



Table 11: Opportunity: overall rating/concordance

Opportunity	Demand side	Supply side	AITI
FRAUNHOFER OPPORTUNITIES			
Social media/web-communities	Medium	Medium	Medium
Indoor and outdoor navigation	High	High	High
Holistic management systems	High	High	High
Web-based fitness programs/courses and empowerment	High	Medium	High
Telecare/telehealth systems	High	High	High
Service and care robots	No	No	No
Mobility support	High	High	High
Smart TV	Medium	High	High
Nutritional support systems	High	High	High
CARE ORGANISATION OPPORTUNITIES			
Physical training/fitness/rehabilitation equipment	High	Medium-high	High
Assisted mobility products	High	High	High
Global positioning systems, gaming technology, alarms and security devices, telehealth and tele-med apps	High	High	High
Systems and packages for energy and water conservation and efficiency.	High	High	High
Lifting and safety equipment, beds	High	High	High

However, the target areas identified represent strong opportunity. Further evaluation which will be needed to capitalize on these opportunity areas, will very likely confirm their high potential value to interested firms and to the state's economy.

This represents an important strategic opportunity. Systems, systems integration and low cost solutions align to the Fraunhofer priority areas, and are areas of current strength in South Australia that can be built upon to deepen the involvement of the state's companies in AT markets. Capabilities in these areas broaden the potential range of products in which local firms could become involved, and potentially, the rate of new product development. Hence, development of these capabilities should be a focus for policy intended to maximise benefits to the state economy.

As discussed in Section 9 co-design and co-laboratory approaches can accelerate new product development by creating propinquity between manufacturers, researchers and end-users.



Linking this to the underlying systems and solutions capabilities of many South Australian firms will help sharpen the picture on precisely what products local firms should prioritise for diversification.



10 Models for collaborative industrial transformation: Co-Design Centres and Living Labs

10.1 Models for industry transition and development

While we can expect significant growth in the demand for AT products and services, and while there is a pressing need to achieve transition to growth sectors in the South Australian manufacturing sector, there are nonetheless significant barriers to successfully achieving such transition. Local firms need to develop new capabilities and connect to new markets. The potential for productive collaborations between all parts of the AT sector need to be fully explored, particularly collaborations between manufacturers, distributors and large purchasers of AT products and services. Opportunities for the application of local research and all types of innovative development need to be promoted and supported. In this section we examine the potential for innovation centres, co-design centres and living labs to contribute to these processes and thereby maximise the chances of successful industrial transition in this State.

Around the world there has been substantial development in formulating new institutional and organisational responses to significant social and demographic change and the industrial implications of such change. Such responses are based on a set of ideas, strategies and organisational designs that are aimed at facilitating industrial transitions, developing new businesses and fostering innovation. The organisations or programs that are created to achieve these objectives take a number of different forms that are variously described as innovation centres, industry and business incubators, industrial clusters and, more recently, co-design centres and living labs. Each of these models represents a variation on encouraging business and industry innovation development and growth.

Business incubators, for example, emphasise the objective of growing young or start-up companies in a relatively narrow industry category. The concept is driven by the idea that young businesses working in proximity to each other can share resources, leverage, networks, share ideas and improve growth prospects and performance.

The more recent concepts of co-design centres and living labs have emerged in response to the need to develop solutions to complex social and economic change particularly in relation to delivering new products and services to emerging needs. A central concept for both of these models is the involvement of all stakeholders, but particularly end users, in the processes of conceptualising, designing and developing new product and service solutions.

The need to build closer relationships and improve coordination has been highlighted by the National Disability Insurance Authority in its recent discussion paper *Towards Solutions for Assistive Technology* comments:

The NDIA is keen to ensure there is a mechanism to explore and collaborate with people with disabilities to ensure innovation is captured and experiences are shared so the best use is made of existing and potential technologies.

There is an opportunity to develop assistive technology products with uniquely Australian designs and using ultra-resilient materials and technologies [...].

Although there are a number of specific assistive technology research and development activities underway around Australia, there is very little coordination of these across the sector and the



capacity to share these across regions and communities has been limited. There is now an opportunity to coordinate these efforts and strengthen the approach to innovation and research and development for new and emerging assistive technologies in Australia.

In the context of industrial transformation currently needed in South Australia, and the opportunities presented by the growth of AT, it is important to consider carefully which of these models are likely to be most useful.

One of the early decisions that must be made is whether these types of organisations have a particular physical presence, essentially dedicated building space, or whether they are more in the nature of the program and a system of collaboration between the various stakeholders. This decision will be dependent upon, among other factors: the level of resources available for the initiative, the physical location of various stakeholders, the types of activities that are expected to be executed within the program and the outcomes that are expected of the initiative and the extent to which it needs to be medium or long term. It is probably also worth observing that the optimal solution may be a mix of both.

10.2 Global policy developments

10.2.1 Living Labs, Co-laboratories and Co-design

The distinguishing feature of a Living Lab is an open innovation process that deeply engages end users throughout the innovation and development cycle.

In more detail LILAN (Living Labs in the North) describes Living Labs as:

Living Labs is defined as a forum for research and innovation applied to the development of new products, services and processes. It employs working methods to integrate people into the entire development process as users and co-creators and recognises the needs of users and the working conditions of service providers, both in their respective contexts. For service development the term 'user' also includes active service providers.²⁷

In the context of AT a living lab approach would include older people and people with a disability, care organisations, vendors and distributors of AT products as well as the designers and producers of AT. It also includes deep engagement with researchers from a range of disciplines.

The European Union describes the benefits of Living Labs as:

- Bringing the users early into the creative process in order to better discover new and emerging behaviours and user patterns
- Bridging the innovation gap between technology development and the uptake of new products and services involving all relevant players of the value network via partnerships between business, citizens, and government
- Allowing for early assessment of the socio-economic implications of new technological solutions by demonstrating the validity of innovative services and business models.²⁸

Reflecting the popularity of the Living Labs concept in Europe, the EU has established the European Network of Living Labs (ENoLL). It counts “340 accredited ENoLL Living Labs” and

²⁷ <http://www.lilan.org/en/Living-labs-description/> accessed 02/06/14

²⁸ Living Labs for user-driven open innovation: an over view of the living labs methodology, activities and achievements, European Communities, January 2009



offers various levels of membership for appropriate organisations. While concentrated in Europe, there are member organisations across the globe including in North and South America, Africa, and Australia. ENoLL offers a range of branding, brokering, policy and governance and project-based services.

Co-design refers to a design methodology or philosophy. In a nutshell “The idea is simple: nobody knows better how services can be improved than the people who use them and the front-line staff who provide them.”²⁹ This perspective refers to service design and delivery but co-design is equally applicable to new products. There will always be a role for the designer-entrepreneur perhaps best personified by Steve Jobs who famously claimed that “A lot of times, people don’t know what they want until you show it to them.”³⁰ But, equally there is a role for collaborative design in a range of product and service domains.

Fraunhofer has been at the forefront of the development of living labs and co-design processes in Europe. It established the Ambient Assisted Living Alliance in 2007 to develop integrated AT solutions in collaboration with users. Since this time it has been active in the development of living labs and supportive research infrastructure at its Stuttgart facility.

²⁹ <http://www.govint.org/co-design/> accessed 02/06/14

³⁰ http://en.wikiquote.org/wiki/Steve_Jobs accessed 08/0614



11 Strategic Directions

An important part of the ATMO project brief was to deliver policy proposals to capture AT opportunities. A strategy including an Assistive Technologies Industry Development Program and a possible Assistive Technologies Industry Innovation Centre (referred to as AT Co-design Centre in this report) were flagged. A 5-year industry development and an investment attraction strategy for the industry were discussed, based on opportunities identified through the Demand/Supply/Capability process³¹.

As previously explained, the targets identified here are proximate 'product classes', due to gaps in data that have prevented further pinpointing at this stage. Further work is therefore required, particularly the application of a co-design approach to AT industry development.

11.1 AT co-design facilities in South Australia

Living laboratories and co-design facilities have merit in bringing users, care organisations, manufacturers and researchers to drive product and service innovation, exchange knowledge and skills and accelerate the development of industries where strong product and service demand is in existence.

The establishment of Living Labs with a strong demand driven and client centred focus has the potential to accelerate the development of South Australia's AT industry. As well as providing much needed global AT industry development intelligence and fostering collaboration between key stakeholders, Living Labs can be the focal point for the design of AT industry development strategies and programs grounded in international best practice. Living Labs can provide a forum for the involvement of manufacturers, researchers, designers, product and service providers and end users in this process.

Living Labs can undertake a range of activities designed to promote the development of AT industry development in the Northern Adelaide region. Specific functions and activities would include:

- Provide a forum and venue for collaboration for AT stakeholders
- Undertake market and technology foresighting
- Promote uptake by local firms of Key Enabling Technologies (KET)³² such as photonics and sensing technologies and new materials such as titanium and additive manufacturing in the design and development of new AT products
- Facilitate and assist new AT business start ups
- Facilitate 'market making' interactions between AT users, AT producers and researchers
- Assemble stakeholders to develop new concepts and products and services in the AT domain
- Be a focus for AT cluster development
- Connect AT producers with other facilitating government programs

³¹ Spoehr J, Worrall L, Sandercock P, Eyre J, Molloy S. 2014. *Assisting transition: Assistive technologies opportunities and industrial transformation in South Australia*. Adelaide: Australian Workplace Innovation and Social Research Centre, The University of Adelaide, p 13.

³² Key Enabling Technologies include nanotechnology, micro-electronics, nano-electronics, photonics, advanced materials and advanced manufacturing technologies.

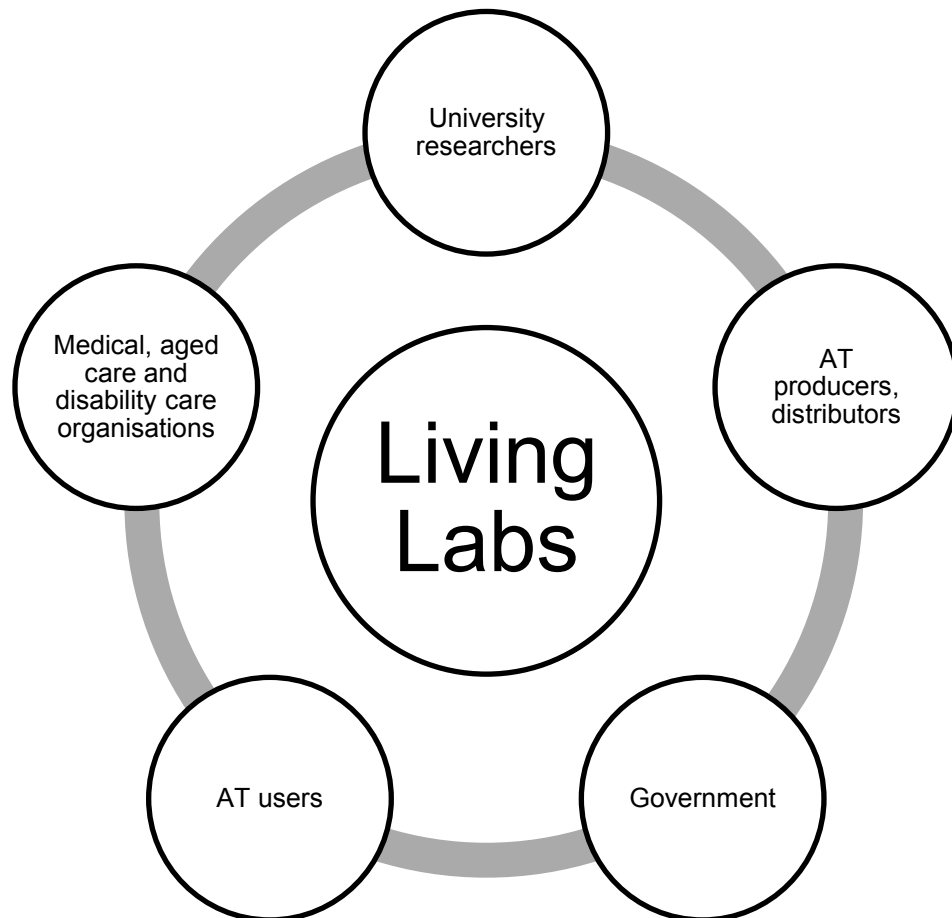


- Research export opportunities in AT.

The stakeholders participating in Living Labs would include:

- Actual and potential AT producers (of both products and services), distributors and importers
- Medical institutions and care organisations
- All levels of government
- AT users and user groups
- University researchers.

Figure 10: AT Co-design and stakeholders



An ongoing focus of Living Labs would be to support a collaborative approach to identification of AT opportunities linking closely to existing and emerging end user needs. This would involve actual and potential AT producers, medical and care organisations and researchers with technology or innovations to bring to the AT market.

The goal of this process would be to identify gaps and opportunities in AT that represent commercial opportunities for South Australian AT producers and to map out steps that could be taken to initiate production of products and services in South Australia aimed initially at the local market but with prospects for interstate and international export.



This is consistent with key statements above, that a needed policy-focus is on strengthening local firms' capabilities in systems and sub-systems, systems integration and low-cost solutions, as the platform for participation in a wide range of potential product/market areas, whilst the role of Living Labs is to help define which products and to accelerate their development.

Overseas experience tells us that co-design principles and approaches can be applied whilst ensuring intellectual property rights (in the absence of which the aim of accelerated product development and diversification would be undermined).

Consideration would need to be given to the interests of the various stakeholders in these processes and the principles of co-design and living labs would need to be carefully investigated and applied in order to maximise commercial results. Key functions of such a facility might include:

FORESIGHTING

- Social, economic, cultural and demographic drivers of demand for different forms of AT
- Understanding the influence of disruptive technologies on the development of AT
- The role of design led innovation processes in the development of AT
- Identifying the workforce development and policy implications of the above.

MAPPING

- Generation of industry intelligence, particularly local and international demand mapping and trend analysis, to target and inform the development of credible industry development and investment attraction propositions and opportunities
- Identification of high value credible opportunities for local industry development and foreign direct investment attraction
- Mapping the current capacity and capabilities of existing South Australian industries, including companies outside AT with the ability to effect a transition to these new opportunities, against the prospective demand for AT (capability mapping)
- The identification of capacity and capability gaps needing to be addressed, leading to recommendations
- Using opportunity and capability information and gap analysis to ensure we focus on both our strengths and areas of high value and high and growing demand in order to build local capacity and to attract targeted new investment into South Australia, leading to recommendations, including development of clusters.

COLLABORATION BUILDING

- Broker and facilitate multi-stakeholder engagement in specific AT product and service development projects targeting domestic and international markets
- Development of AT Online as an AT knowledge exchange and networking website
- Location in the Playford Alive precinct would provide an opportunity to explore co-design of Smart Houses as part of the building and refit programs being undertaken in the region.

Recommendation 1: It is recommended that a network of Living Labs be established to support the development and application of an integrated approach to AT industry development in South Australia. Adopting a demand driven industry development approach, Living Labs would build on existing initiatives. It is envisaged that Living Labs would provide foundational strategic,



facilitative and engagement services to support acceleration of AT industry development in SA based on strong collaborations with Fraunhofer IAO and the South Australian node of the Innovative Manufacturing Co-operative Research Centre which has a strong focus on AT.

11.2 Leveraging Existing Resources

As well as attracting new resources from industry and government Living Labs would seek to leverage existing resources. To ensure an efficient approach it is important that efforts are made to leverage existing resources and programs to assist AT companies and those seeking to diversify into AT, deepen their knowledge and build capability to successfully participate in the AT industry.

An explicit focus on AT in application of a range of existing State and Federal Government industry and business extension programs could be adopted. Equally there is considerable opportunity associated with the recently announced investment attraction agency, together with the state node of the Innovative Manufacturing Cooperative Research Centre through the Stretton Centre.

These resources should be directed at AT market research, market entry, investment for innovation and new product development, with a focus on firms at a higher and more immediate level of readiness. They would also be directed at deepening of systems and sub-system integration capabilities and capacity to develop low cost solutions with application to a range of AT products and services.

Recommendation 2: It is recommended that an Assistive Technologies Industry Forum be held in 2017 to explore how existing programs might support AT industry development initiatives.

11.3 Capability Assessment

Diversification into the production of AT requires detailed enterprise capability assessment and the development of a diversification strategy. There is a need to deepen knowledge of all potential candidate companies and assess them for potential to transition into AT. The target companies for assistance would, initially, likely be those with a higher and more immediate level of AT-readiness. Beyond this, there is a need to expand the cohort of companies, and deepen knowledge and data bases of the full range of potential companies.

Further work is required to identify the keenest, most capable companies for focus over the short- to medium-terms. These would become target companies for AT co-design projects and wider capacity and capability building including enterprise improvement, addressing capability gaps, clustering, and industry-led research and co-design approaches.

Recommendation 3: It is recommended that an Assistive Technologies Enterprise capability assessment and innovation program be offered to companies interested in diversification into AT product and service development.

11.4 Industry Network Development

The development of strategic industry networks can help to leverage demand, foster knowledge and skills transfer and open up new paths to market.



There is a need to aggregate demand and build critical mass through industry networks and collaborations involving research organisations, manufacturers, AT retailers and distributors, care and service organisations and public procurement agencies. The objective would be to:

- Aggregate demand for common items across care organisations where possible, as well as with government purchasing authorities (including the refurbishment of all Housing Trust stock over the coming 15 years)
- Leverage demand from trusted large service organisations such as the RAA, adaptable infrastructure and a desire to expand their service offerings to their large membership
- Build high quality lead customer relationships
- Leverage, where possible, the market reach of retail and wholesale importing organisations with an interest in branding their own products or otherwise supplementing their range with locally produced items
- Enlist large companies with market reach to mentor SMEs and assist their making inroads to global markets.

Recommendation 4: It is recommended that an Assistive Technologies Industry Network (ATIN) be established to support the aggregation of demand and to build critical mass and support collaborations.

11.5 Procurement

The formal and practical elements of current procurement policy and practices should be assessed to ensure any changes required to improve the systems performance in promoting local innovation. It is recognised that the safety and reliability of AT is an over-riding concern, together with value for money. Both can be achieved – indeed, enhanced -whilst extending opportunities to local firms to innovate and participate in AT development through public procurement. Public procurement is indeed one of the key ways in which to promote local innovation and industry development whilst also better meeting the specific needs of end-users. Programs such as the SBIR are designed to achieve exactly this. Over-restrictive conditions on procurement can close off such opportunities.

The introduction of Consumer Directed Care in the aged care and disability care sectors will have transformative impacts on procurement practices. It is important the implications of these new policy directions are fully understood and opportunities to foster AT industry development identified.

Recommendation 5: It is recommended that a review of AT procurement be undertaken to identify opportunities for application of smart procurement principles to help drive AT innovation and AT industry development.



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Appendix A: Approach to Opportunity identification

Demand/Supply/Capability methodology

Aligned with the overriding purpose of the Project to identify high value opportunities for the diversification of South Australian manufacturing and service companies, a staged methodological approach was adopted. The Demand/Supply/Capability (DSC) approach is described in detail in an earlier publication³³. The DSC approach was designed to begin the process of identifying high value credible opportunities for local industry development and, possibly, foreign direct investment attraction, in the following manner:

- Understanding demand for high value AT products, nationally and internationally, at as disaggregated level as possible
 - For this purpose, key data include ISO 9000 product code based data, international trade data, and Australian import data
 - Interpreting these data for Australia, distinguishing AT items that are:
 - ‘Naturally protected’ from import competition or otherwise likely to be sourced from within South Australia and Australia due to bulk, or high service content to meet customisation requirements, or strong existing capability, possibly linked to university research activity and protected unique intellectual property, from
 - Those mostly sourced from overseas, but that might be able to be manufactured competitively in South Australia, from
 - Those unlikely to be able to be produced efficiently over the 5-year strategy (and will therefore remain import-dependent).
- Creating a ‘first cut’ list for investigation from this
- Mapping the current capacity and capabilities of existing South Australian industries, including companies outside AT with the ability to effect a transition to these new opportunities, against the prospective demand for particular AT products
- Looking for alignment and intersection of new product diversification opportunities suggested by the demand analysis with capabilities of local companies (either existing or able to be acquired in a reasonable time and at a reasonable cost, by addressing capability gaps).

AT data limitations

However, it should be noted that data limitations prevent analysis of demand trends and growth at the detailed product level. There are so far no publicly available studies that provide a detailed insight into AT demand trends or expected sales figures of AT segments. Analyses at the ISO 9000 product level, for example, do not yet exist, and assessment of current and future demand

³³ Spoehr J, Worrall L, Sandercock P, Eyre J, Molloy S. 2014. *Assisting transition: Assistive technologies opportunities and industrial transformation in South Australia*. Adelaide: Australian Workplace Innovation and Social Research Centre, The University of Adelaide.



is hampered by several factors. These include the lack of concordance between ISO classifications and trade-based data.

These factors qualify to a small degree the ATMO project's original aim of providing a 'demand/supply/capability matrix' of medium- to high-complexity AT opportunities. This is in the sense that, at this stage, the degree of resolution of the picture of opportunities in AT for South Australia is not at the discrete product level but more at the broader 'product class' or 'product category' level.

The best way of dealing with this is to triangulate a number of information sources to arrive at credible quantitative estimates and qualitative judgements. Moreover a co-design process would greatly aid in the identification of product opportunities that respond in an integrated way to user needs, exploiting the full range of technological solutions in a human centred way.

Hence, the approach taken in this report utilises, compares and triangulates several information and data sources:

- Broad aggregate demand information (reported in Section 5)
- Information and analysis provided by Fraunhofer
 - This is highly valuable information which, whilst not able to provide values or growth rates at product level, for reasons given above, identifies and discusses technologies that evidence high growth currently and into the future, and represent opportunity areas for SMEs.
- More concrete demand information and commentary provided by experienced care and service provider organisations through interviews, surveys, and two industry workshops
- Detailed information and commentary on supply side capabilities of local companies obtained through interviews, surveys, and two industry workshops
- Advice from the ATMO project Industry Reference Group, comprising care and user organisations, government industry development practitioners and local manufacturers
- Feedback from a one-off 'Demand Side Forum' convened to respond to inputs from Fraunhofer and others
- Information and analysis provided by other multiple sources.

This enables opportunity-identification at the 'product class' level, as distinct from individual products. Given that medium- to high-complexity AT opportunities for the state's companies will often be at the component and sub-component level, potentially applicable to a number of product and service categories, and in the integration of components into flexible functional systems, this limitation compared to the initial ambition is not a major flaw or undermining of the utility or aims of the ATMO project.

The broader Fraunhofer-identified categories are well-validated areas for further, more finely-grained examination for opportunities relevant to South Australia's SMEs and their capabilities and capacities. In addition, the Fraunhofer trend analysis does reference the ISO classifications relevant to the broader product and service categories being considered, and this will aid opportunity identification in subsequent AT based activities and analysis.

There is a further aspect, beyond gaps in the data, to the present focus on the product class – rather than individual product – level. This is also reflective of the fact that the main opportunities for SMEs will often be in componentry and sub-systems rather than in complete products, and, critically, in systems integration. Such integration tends to be product-nonspecific and high value,



with applications in a range of areas. As discussed later, a co-design approach is likely to prove fruitful in the process of identifying specific product opportunities for development.



Appendix B: Research and development of AT products and services

The significant interest in AT is indicated by the extent of research occurring around the world. There are based AT research centres at universities in Europe and the USA as well as several in Australia. These are typically focused on particular areas of AT usually at the more complex end of the spectrum.

In addition, government agencies have established organisation to promote the use of AT and international conferences are now common.

A number of the university research centres are also focused on industry development. An example is the Assistive Technologies Research Center, College of Engineering and Computer Science, Wright State University, Ohio, USA. One of the goals of ATRC is “conducting industrially relevant R&D and technology transfer and commercialization for creating economic development”.

International university based research

ATRC Assistive Technologies Research Center, College of Engineering and Computer Science, Wright State University, Ohio, USA

The ATRC mission includes: (i) conducting cutting edge engineering-driven basic and applied research on devices, methodologies and technologies for enhancing assistive and diagnostic discoveries for people of disabilities and the elderly; (ii) promoting activities relevant to assistive technologies and discoveries; (iii) conducting industrially relevant R&D and technology transfer and commercialization for creating economic development.³⁴

The Rehabilitation and Assistive Technology research group, University of Sheffield, Yorkshire, United Kingdom

The Rehabilitation and Assistive Technology (RAT) research group at the University of Sheffield is a multidisciplinary team researching the use of assistive technologies, and investigating the use of these technologies in prototype and practice.

Bath Institute of Medical Engineering

‘Designability’ is a national charity joining expertise and knowledge to enhance people’s lives.

The BIME was established in 1968, with support from the University and local health board and now based in the Wolfson Centre at the Royal United Hospital, Bath. Although an independent body, the Institute has strong academic collaborations with the University of Bath.

BIME has engineering and design experts with a passion for creating life-changing assistive technologies, conducting original research and developing commercial products, according to the following core themes:

- Medical Engineering
- Children’s Mobility and Seating

³⁴ <http://cecs.wright.edu/atrc/vision%20and%20mission%20objectives.html> accessed 07/03/2014



- Technology for People living with Cognitive Impairments and Dementia
- Technology for the Ageing Population.

BIME investigates areas of unmet need and applies research methodology to measure the outcomes and benefits of various interventions. Many of its projects are carried out with a multidisciplinary team of researchers. The Institute also works collaboratively with the best local and national academic healthcare partners.

Newcastle University: SALT - Designing Scalable Assistive Technologies and Services

This project brings together a strong consortium of academics, businesses, health and social care professionals, third sector organisations and user representatives to address challenges and opportunities in both economic and business models, to develop assistive technologies to promote independence for older people.

SALT's main objectives are to identify and develop new business models for scalable assistive technologies and services to promote sustainable market development for independent healthy living in the mixed digital economy; and to understand the factors that promote or inhibit the uptake, use and integration of assistive technologies for older people living in the community from a user-centred perspective.

UMass Boston and IBM Advance Technology Accessibility Research

The University of Massachusetts Boston (UMass Boston) and IBM (NYSE: IBM) has sponsored a new research initiative to advance accessible technology solutions for people with disabilities, the growing elderly population, those with low literacy and novice technology users.

IBM will provide access to technology and industry expertise to students, professors and researchers at UMass Boston's newly formed School for Global Inclusion and Social Development.

IBM and UMass Boston will work with state and federal government agencies as well as local and global non-governmental organizations to advocate for key policies and legislation related to technology accessibility. Additionally, the collaboration will explore new ways to integrate assistive technologies into the design of mobile devices, apps or websites that enable access for people with disabilities and improve the overall user experience.

Other AT research / promotion initiatives

The Association for the Advancement of Assistive Technology in Europe

AAATE's mission is to stimulate the advancement of assistive technology for the benefit of people with disabilities, including elderly people, and is the interdisciplinary pan-European association devoted to all aspects of assistive technology, such as use, research, development, manufacture, supply, provision and policy. Over 250 members from all over Europe and throughout the world currently take part in the AAATE.³⁵

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³⁵ <http://www.aaate.net/about> accessed 07/03/2014



<http://www.emeraldinsight.com/journals.htm?issn=1754-9450>

DOCTRID Conference in Assistive Technologies for people with Autism and Intellectual Disability

The first structured research programme in Europe to develop Assistive Technologies for People with Autism and Intellectual Disability was launched 15 October 2013.

The ASSISTID EU Marie Curie COFUND programme will promote research into the development and application of assistive technologies for the practical benefit of carers and individuals to enhance the quality of life for people with intellectual disabilities.

A recent National Disability Authority Ireland (NDA) report states “*Assistive Technologies is centrally important for disability policy as it is one of the more concrete ways that the barriers to participation in society can be overcome for people with disabilities*”.

Symposium: Global Challenges and Global Collaboration in Assistive Technologies, EU

Three key areas were explored in the course of the Symposium and Workshop:

1. Establishing and utilizing internationally-based collaborations to conduct Assistive Technology research using EU Horizon 2020 Funding instruments
2. Creating a global assistive technologies consortium to access and utilize new European Union research and development funding to partner in collaborative research
3. Maximizing the role of international assistive technologies R&D structures including DOCTRID and AAATE, the private sector, advocacy groups and charities to expand access to diverse networks, assess research initiatives for broader impact and advice on policy and new directions.

Australian university-based AT research and other activities

The Medical Device Research Institute, Flinders University

The Medical Device Research Institute (MDRI) is a multi-disciplinary research network that aims to be the national research leader in the medical devices industry. The MDRI is a network of researchers, highly skilled in the development and application of a diverse range of medical technologies. This collaborative approach to the research for innovative solutions and services makes the MDRI useful as a single site for product development and testing - taking projects from fundamental concepts through to preliminary clinical trialling.

The MDRI includes more than fifty researchers and clinicians from Flinders University, Flinders Medical Centre and the Repatriation General Hospital. The MDRI collaborates in research, development, application and commercialisation of medical devices and technologies.

Medical Device Partnering Program

The MDPP brings together industry, researchers, government and end-users to accelerate development of cutting edge medical devices. The MDPP coordinates the efforts of key stakeholders, focusing on problem-solving for clinicians, people who are ageing and people with disabilities. It provides a mechanism for the development of prototypes, proof of concept and/or commercialization planning for potential Australian medical device products.



The MDPP is explicitly an industry development initiative and states: *“Medical devices provide Australia with the opportunity to position itself in a growing global market, taking advantage of current research and manufacturing capability across the nation”*. In 2013, the MDPP received triennial funding from DSD to facilitate the delivery of the Medical Technologies Program under the state’s industry strategy, *Manufacturing Works*.

Assistive Technologies for Virtual Rehabilitation Engineering (ATVRE)

ATVRE aims to merge smart engineering and rehabilitation technologies to enable individuals with disabilities to perform functions that might otherwise be difficult or impossible. It brings a cross-disciplinary team of University of Sydney’s senior key Researchers from multiple Faculties, together with a network of distinguished external associate investigators.

Assistive technologies for aged care, University of Southern Queensland

“Technologies are increasingly available but the challenge is getting those technologies into the hands of people who can benefit. We need quality research data to prove the benefit.”

The focus is on alleviating falls, incontinence, social isolation and cognitive decline are significant issues for the elderly - about one third of people over the age of 65 have a fall once a year and that is often the trigger for people to end up in a nursing home.

Independent Living Centre NSW: The Economics of Assistive Technology - Health Economics

In 2006 the Fremantle Collaboration commissioned an investigation of the economic framework for people with a disability and the provision of specialist equipment for their needs. The Research Partnership Project is entitled ‘*Assistive Technology in Australia: Economic Analyses from a user standpoint – methodological implications*’. Independent Living Centres Australia, the National Council on Rehabilitation Engineering and Novita Tech are grant industry partners.

Papers were presented at two state-wide, four national and nine international conferences. Other outputs include publication of a book chapter, a number of refereed abstracts and a refereed journal article (in press). Key external links were established with Renzo Andrich of Don Gnocchi Foundation, Italy.

At its third research workshop the Fremantle Collaboration decided to change its name to Assistive Technology Collaboration and to establish a public website.

Articles and Papers:

- Assistive Technology - A part of the rehabilitation solution poster (PDF, 1Mb)
- Assistive Technology - A part of the rehabilitation solution abstract (PDF, 18Kb)
- Assistive Technology and Universal Design (PDF, 18Kb)
- Equipped for Living (PDF, 27Kb)
- Universal design: Is it accessible? (PDF, 22Kb)
- Using the ICF in economic analyses of Assistive Technology systems: Methodological implications of a user standpoint (PDF, 18kb).



Appendix C: Full schedule of assistive technologies

A full schedule of assistive technologies according to ISO classification is given below with examples.

04 ASSISTIVE PRODUCTS FOR PERSONAL MEDICAL TREATMENT
04.33 Assistive products intended to manage tissue integrity (2440)
04.48 Equipment for movement, strength and balance training (1920)
04.24 Physical, physiological and biochemical test equipment and materials (694)
05 ASSISTIVE PRODUCTS FOR TRAINING IN SKILLS
05.03 Assistive products for communication therapy and communication training (288)
05.12 Assistive products for training in cognitive skills (244)
05.15 Assistive products for training in basic skills (216)
06 ORTHOSES AND PROSTHESES
06.12 Lower limb orthoses (1327)
06.24 Lower limb prostheses (886)
06.06 Upper limb orthoses (836)
09 ASSISTIVE PRODUCTS FOR PERSONAL CARE AND PROTECTION
09.33 Assistive products for washing, bathing and showering (4036)
09.12 Assistive products for toileting (2448)
09.03 Clothes and shoes (2059)
12 ASSISTIVE PRODUCTS FOR PERSONAL MOBILITY
12.22 Manual wheelchairs (2607)
12.23 Powered wheelchairs (2020)
12.36 Assistive products for lifting persons (1879)
15 ASSISTIVE PRODUCTS FOR HOUSEKEEPING
15.09 Assistive products for eating and drinking (1460)
15.03 Assistive products for preparing food and drink (691)
15.15 Assistive products for making and maintaining textiles (301)
18 FURNISHINGS AND ADAPTATIONS TO HOMES AND OTHER PREMISES
18.12 Beds (3347)
18.09 Sitting furniture (2257)
18.18 Supporting handrails and grab bars (2113)
22 ASSISTIVE PRODUCTS FOR COMMUNICATION AND INFORMATION
22.27 Assistive products for alarming, indicating, reminding and signalling (2391)
22.03 Assistive products for seeing (1552)
22.36 Input devices for computers (1443)
24 ASSISTIVE PRODUCTS FOR HANDLING OBJECTS AND DEVICES
24.18 Assistive products to assist or replace arm function, hand function, finger function or a combination of these functions (860)
24.09 Assistive products for operating and controlling devices (807)
24.13 Assistive products for controlling from a distance (363)
27 ASSISTIVE PRODUCTS FOR ENVIRONMENTAL IMPROVEMENT AND ASSESSMENT
27.06 Measuring instruments (109)
27.03 Assistive products for environmental improvement (56)
28 ASSISTIVE PRODUCTS FOR EMPLOYMENT AND VOCATIONAL TRAINING
28.03 Workplace furniture and furnishing elements (739)
28.15 Machines and tools for use in the workplace (247)
28.06 Assistive products for transporting objects in the workplace (137)
30 ASSISTIVE PRODUCTS FOR RECREATION



