SOLVED

An investigation into the operational and knowledge capture processes of Solve Disability Solutions.

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RMIT University

The researchers respectfully acknowledge the people of the Woi wurrung and Boon wurrung language groups of the eastern Kulin Nation on whose unceded lands this research has been conducted, and pay respect to their Ancestors and Elders, past, present and emerging.

This study was funded by RMIT's Enabling Capability Platforms (ECP) through the Strategic Capability Development Fund (SCDF), and was conducted by Industrial Design and Biomedical Engineering educators and researchers from RMIT University.

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Executive Summary

This report details an investigation by RMIT researchers into the knowledge capture and knowledge sharing procedures used by Solve Disability Solutions (Solve) which aimed to facilitate their operations and better support their volunteer network.

Solve offers assistive technology solutions to clients with disabilities, chronic disease and age-related conditions to improve quality and life and enhance mobility and independence.

Solve's client support activities are delivered by a small team of Occupational Therapists (OTs) working in collaboration with a large volunteer network; many of whom are retired engineers and fabricators, with specific and relevant knowledge and skill sets. These volunteers work from their own premises to collaboratively design, develop and prototype and fabricate Assistive Technology enabling solutions for Solve clients.

This system enables Solve to benefit from access to a large network of expertise, but it is possibly vulnerable in regard to critical knowledge and expertise being held outside the organisation, mostly within an ageing volunteer network.

Whilst rudimentary knowledge capture procedures are in place to record project outcomes, it is difficult to accurately capture the full technical specification of complex solutions and many volunteers do not fully complete the process, due to a variety of reasons as detailed within this report.

In addition, as there is no centrally held searchable database of prior solutions, knowledge and expertise available to volunteers, the ability to exploit prior knowledge is not fully realised, and volunteers often work in isolation, despite being part of a large and highly skilled network. This provides risk of unnecessary duplication and operational inefficiencies.

This study was funded by RMIT's Enabling Capability Platforms (ECP) through the Strategic Capability Development Fund (SCDF) and was conducted by Industrial Design and Biomedical Engineering researchers from RMIT University.

Researchers aimed to discover whether an improved knowledge capture and sharing system would provide enhanced support to volunteers and deliver a more efficient and effective operation system.

The study utilised interviews with Solve Occupational Therapists, operational staff and volunteers, together with a survey of volunteers to understand existing procedural systems and to identify areas of improvement with a specific focus on knowledge capture and dissemination, and volunteer support.

This report makes a number of recommendations with regard to operational enhancements, and digital infrastructure to address knowledge capture and volunteer support.

Key stakeholders and contributors

Research Team

Professor Ian de Vere

Ian de Vere is Associate Dean, Industrial Design at RMIT University, and previously was Head of Design at Brunel University London. He is an award-winning industrial designer with extensive industry experience in new product development and user-centred design, and an experienced design educator who is interested in the power of design to make a positive contribution to society. Having worked with students and humanitarian agencies for many years on social innovation projects, in 2019 Ian initiated Safeness by Design, a project that employs design intervention to achieve actual and evident safeness across a range of environment and societal contexts.

Associate Professor Kate Fox

Kate is a biomedical engineer at RMIT University with a strong belief in the use of engineering for the social good. As the former program manager for the RMIT Biomedical Engineering degree she has partnered over 50 students with Solve Disability Solutions to enable client focussed student solutions to be developed. Kate has many awards for her work such as the Victorian Tall Poppy, Engineers Australia's Most Innovative engineer and is a 2019-2020 Superstar of STEM.

Emma Gerard

As a design educator/researcher, Emma has spent the last nine years working and studying across various programs within Melbourne University and RMIT. This diversity has given her a breadth of experience in differing design pedagogies, and practises. Primarily Emma's research and teaching has been focused on the development of; interpersonal skills, creative and design thinking, group work and facilitation strategies, communication, and social & sustainable design projects. Emma has a great interest in the power of education and information to create positive social change, and a passion for an empowered student-centred approach to learning and teaching.

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Rosemary Nolan | CEO | Solve Disability Solutions
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Solve volunteer network

The researchers recognise the Solve volunteer community whose gracious contribution of time and expertise bring significant benefit to the clients of Solve and we thank those volunteers who contributed to the findings of this study (through interviews or the online survey) under the assurance of anonymity.

Acknowledgments

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Background

Assistive Technology (AT) is any device, service or system that allows the user to perform tasks they are unable to accomplish (World Health Organisation 2018). ATs are assistive, adaptive, and rehabilitative devices that enable the performance of activities of daily living or increase the ease and safety with which a task can be performed; promoting independence and social participation and supporting users and their carers.

Solve Disability Solutions (Solve) is a not-for-profit organisation which provides a state-wide (Victoria) Occupational Therapy (OT) service and designs and produces custom Assistive Technology equipment for:

- people of all ages living with disability,
- older people (over age 65),
- people with chronic diseases such as diabetes and stroke,
- people with neurodegenerative disease conditions,
- people of all ages with gradual functional decline, and
- families and carers for any of the above.

Solve is a member of TAD (Technical Aid to the Disabled) Australia, an Australian federation of state based not-for-profit organisations which provide personalised equipment, technology, and services to disabled persons, including children.

Its core workforce are in-house OTs and skilled volunteers (working in their own workshops) who use their industry experience to design and then build custom (assistive technology) equipment to suit the individual's specific needs. Whilst each solution is custom made for the specific client and their environment and needs, across the portfolio of projects there is a commonality of needs and solutions, especially when addressing age related issues.

Solve is a registered National Disability Insurance Scheme (NDIS) provider and most of its projects are NDIS funded. Once a client has been referred to Solve and assessed by the Solve OTs, a volunteer is engaged to undertake preliminary design work and develop a quotation for NDIS approval. Once funded, detailed design development and testing will commence, and the project will be realised with a robust and safe, bespoke AT solution.

National Disability Insurance Scheme

The National Disability Insurance Agency (NDIA) is an independent statutory agency whose role is to implement the National Disability Insurance Scheme (NDIS). The NDIS provides funding to an estimated 500,000 Australians who have permanent and significant disability.

Most Solve projects are classified (and funded) under NDIS Assistive Technologies Complexity Level 3 (specialised AT solutions) or Level 4 (complex AT solutions) (National Disability Insurance Scheme 2017).

NDIS Assistive Technology Level 3 is where there is a need for specialised (not off the shelf) AT solutions due to:

- greater complexity in participant need, and/or
- the requirement for customisation, interconnection and/or integration with other AT or the person's home/work/ place of study, and/or
- risk of injury if incorrectly set-up/issued is high or not obvious to the operator.

NDIS Assistive Technology Level 4 is where there is a requirement for a complex AT solution where the AT may:

- be custom made or 'off the shelf' but configured uniquely for the person,
- require interconnection or integration with other AT or the persons home/work/ place of study, or
- carry significant risk (hospitalisation or death).

Solve clients could fall into any of the three NDIS participant capacities (NDIS 2015):

- novice participant – one with little experience using AT where their needs, goals, or living situation are new or changing significantly,
- developing participant – one who has experience using AT to meet their needs that is not directly applicable, but may be experiencing a gradual change in condition (e.g. due to ageing), or a change in place of work or study or home, or there is a significant development in availability or type of AT, or
- expert participant – a person has significant experience using AT for an impairment that is stable or changing minimally, and where environments of use and life circumstances are not significantly changed.

RMIT University

RMIT is a global university of technology, design and enterprise and is Australia's largest tertiary institution.

It is ranked 12 in the world for Design and is amongst the world's top 100 universities for engineering studies. Academics and students from RMIT Engineering have been collaborating with Solve for many years, with student teams paired with Solve volunteers to realise AT solutions which have been exhibited in EnGenius, the annual Engineering Showcase in Melbourne. Industrial Design academics have significant experience in Design for Social Impact and innovative product development, and utilise methodologies centred in user-centred design and technical understanding.

This study builds on the existing collaborations between Solve and RMIT, pivoting the relationship towards new and non-teaching related contributions.

Previous Solve-RMIT Collaborations

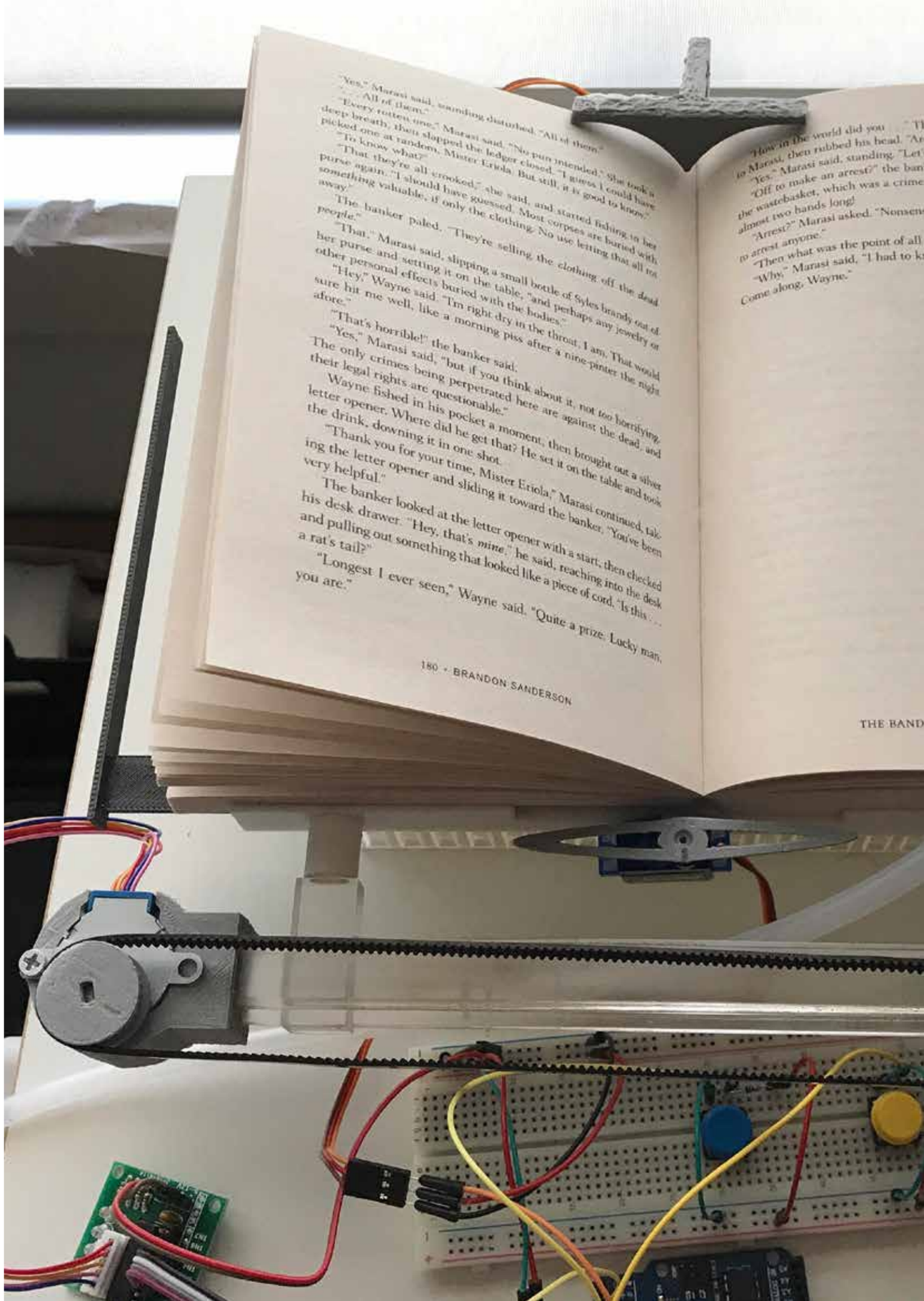
RMIT School of Engineering commenced a partnership with Solve Disability Solutions in 2018 when it became apparent that the resources and facilities with RMIT could provide positive outcomes for Solve and their clients. The partnership commenced with an introduction session held at the Advanced Manufacturing Precinct where Solve Disability Solutions volunteers were briefed about the collaborative projects and invited to view the additive and subtractive manufacturing equipment available to the projects. Through collaboration between Solve's in-house engineer Hassan Malik and Associate Professor Kate Fox from RMIT's School of Engineering, projects were identified by Solve Disability Solutions

and offered to RMIT student groups. Each project team was assigned a Solve volunteer mentor who was responsible for guiding the projects in line with student needs and a RMIT academic mentor who was responsible for guiding the projects in relation to academic assessment tasks.

Initially, pilot projects were offered to undergraduate biomedical engineering students in their 3rd year, before the partnership was extended to include final 4th year capstone projects for all engineering disciplines (including biomedical, mechanical, mechatronics, and computer systems engineering).

Up to the time of writing this report, 32 projects have been undertaken between RMIT School of Engineering and Solve Disability Solutions with 118 students engaged and working directly with Solve Disability Solutions, their clients and their volunteers. At the end of each project (24 weeks minimum project time) the outputs of the collaboration are provided to a general audience at an end of year exposition day.

The 3rd year students have displayed their projects at a RMIT hosted event at the Advanced Manufacturing Precinct where engineering academics, students from all years of the biomedical engineering degree, Solve employees, volunteers and their guests were invited. The 4th year students display their outcomes in a much larger forum at the annual RMIT Engineering ‘Engenius’ event which is held at the Melbourne Convention Centre. The event attracts audiences of over 1000 people including the general public, school children, industry experts and RMIT academics and students.



Introduction

Solve Disability Solutions and volunteers have amassed significant intellectual property and in-house knowledge since their inception, in the form of both simple and complex bespoke designs of assistive technologies for clients with disabilities, chronic disease and age-related conditions.

Project Aims

This research study was established with the intent to understand how this knowledge could be better captured within the organisation and shared across its volunteer network.

Design is transforming the way leading organisations create value. Expanding its impact from the development of products, increasingly design adds value to systems, service and user experiences. Design contributes to development and enhancement of organisational systems by applying a user centred approach to problem solving through a methodology based around ethnographic research, design thinking and service design principles.

Ethnography is the study of people in their environment where researchers observe and/or interact with a study's participants in their real-life environment. Because of its qualitative and subjective

nature, an ethnographic study is beneficial in uncovering and analysing relevant user attitudes and emotions and can help identify and analyse unexpected issues. In this study face to face interviews with selected Solve volunteers were conducted in their own workshops and these findings later directed a follow up online survey.

Design Thinking is an iterative methodology that aims to understand the people for whom the intended product or service is being designed. It is a solution-based creative process that challenges assumptions and redefines problems to identify alternative strategies and solutions. It is useful in looking at problems from a different perspective and to encourage organisations to adapt an empathetic human centric approach and build a stronger understanding of stakeholder needs.

Service Design aims to improve the experiences of both the user and employee by designing and optimising an organisation's operations to better support customer journeys.

Its human centred and iterative process involves complex mapping of people and asset organisation to improve interactions between the service provider and its users, to support an enhanced service provision. Through stakeholder engagement, service design examines the customer experience and the organisational experience in delivering it. It identifies expectations and opportunities and addresses organisational weaknesses.

Research questions

This study asks the following fundamental research questions:

- Could Solve better support volunteers through the availability of clinical knowledge and prior solutions (from knowledge capture)?
- Does Solve require a new or enhanced knowledge capture system to ensure that design solutions, specialist knowledge and expertise are held within the organisation?
- What is the best system to capture this information?
- Would a volunteer accessible expertise and knowledge sharing database improve the support of volunteers and enhance operational efficiency and expediency?

Research Methods

This study utilised a variety of research methods to understand existing procedural systems and to identify areas of improvement with a specific focus on knowledge capture and dissemination, and volunteer support.

Research Methods

Overview

This included multi-stage consultations with Solve operational staff and Occupational Therapists, semi structured interviews with selected volunteers, followed by a broader online survey of volunteers. A stakeholder workshop with staff and volunteers was originally proposed, but due to organisational difficulties and timing, a more direct approach was followed. It is however intended that the findings and recommendations are workshopped across the broader organisational and volunteer community, following receipt of this report. A co-creation workshop session would be invaluable to establish priorities and implementation strategies and to ensure stakeholder engagement. *[refer to Next Steps section]*

Participants & Process

Solve consultations

Solve staff including Occupational Therapists, operational staff and the in-house engineer were involved in consultations throughout the project. Initial meetings identified the focus areas of the study, whilst later consultations reviewed initial findings from the interview process, and scoped the direction and intent of the survey questions.

Interviews

There were eight participants nominated by Solve from their volunteer network to participate in the semi structured interviews with the research team. These volunteers were selected to represent a broad profile of volunteer experience and expertise. Interviews were conducted at the volunteer's workshops to enable researchers to interact with participants in their everyday environment. This process allowed volunteers to exhibit work in progress and demonstrate capability, whilst researchers gained a better understanding of the remote and solo working practices of volunteers.

Online survey

The volunteer survey was conducted online. An invitation was sent to all 66 volunteers who are involved in Solve's bespoke AT development service. Of these, 20 volunteers responded and completed the confidential survey. Whilst not a large sample group, a response rate of 30% is statistically relevant and long-term volunteers (more than 10 years) were well represented. As the survey responses reinforced earlier interview findings, it was concluded that the survey results accurately represented the opinions and feelings of the wider volunteer network.

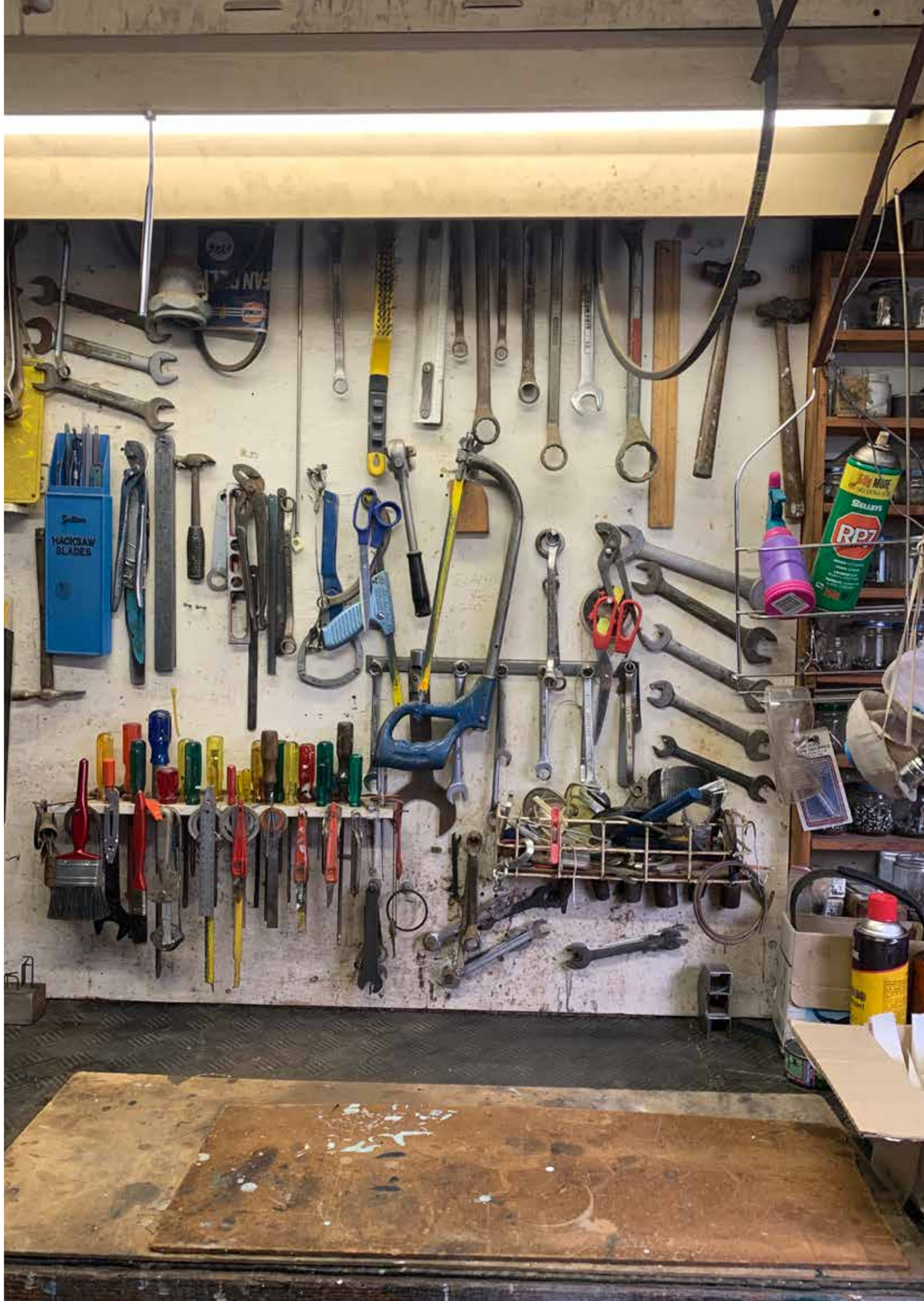
Research scope and limitations

All findings in this investigation are based on anecdotal evidence, revealed through a process of consultation, interview and survey. It was not possible within the scope of the project for researchers to follow projects from initial client contact through to realisation of final outcome, nor was it possible to meet with Solve clients. However, the findings reflect the opinions of experienced volunteers and clinical and operational staff, and as such provide an adequate lens on the operation and needs of the organisation.

It should be noted that the discovery process undertaken by researchers uncovered operational findings which were outside of the scope of this study (as defined by the project aims and research questions), but which were noted and are addressed later in this report.

Ethics

In accordance with the policies regarding research involving human participants, this study was examined by the RMIT Human Research Ethics Committee, and subsequently approved on 25 November 2019 (Ethics Approval No. CHEAN A&B 22567-11/19).



Solve – existing operational methods

In considering the operation methodology of Solve, it was necessary for researchers to map the touchpoints of the existing service provision from the perspective of four key stakeholder groups:

- client/carer,
- volunteer,
- Solve operational staff (Occupational Therapists, engineers, administration), and
- external agencies (referring Doctors, NDIS).

The accompanying customer journey map seeks to illustrate the many stages of a complex project process from initial client referral to project completion. Revisions to this mapping will serve to illustrate operational recommendations later in the report.The three main stages of a Solve client project are:

1. pre-project/initial engagement (client consultation, volunteer briefing, quotation).
2. project
   a. design and development (prototyping & testing),
   b. final fabrication and evaluation (peer review & safety audit), and
3. post project – project documentation.

Within these stages are multiple interactions between stakeholders depending on the complexity of the project. It is worth noting that peer reviews only occur with high risk projects, and that the role of Solve's in-house engineer is not clearly defined in the current model.

SOLVE Disability Solutions

Touchpoint **Map**

Journey **Phases**

- Initial Consultation
- Project Development
- Making & Testing
- Finalisation

Client **Steps**

- Identify need for Assistive Technology
- Reach out to services
- Participate in various assessments
- Submit application for funding
- Funding approved through NDIS
- Participate in testing and feedback
- Receive bespoke Assistive Technology

Service **Touchpoints**

Volunteer Interviews

A small sample of Solve's Volunteers were approached by the Volunteer Coordinator to be interviewed for the study.

Potential participants were identified on the basis of professional experience and expertise, and length of service as a Solve volunteer. Following an initial approach, eight volunteers indicated their willingness and availability and interviews were scheduled at their (home) workshops.

Whilst most participants were highly experienced volunteers, one was relatively new and co-working with a mentor on projects; this provided valuable insight into the experience of new volunteers. With the exception of the new volunteer, all interview participants were retired males – this is reflective of the overall Solve volunteer community.

Interviewees were informed that the study focused on understanding how volunteers can be supported better by enhanced briefings from the occupational therapists including; clinical information and sharing of prior solutions developed by SOLVE volunteers for patients with similar needs, and to discover the merits of a system where the expertise and innovative design solutions from volunteers could be captured and shared across the volunteer network.

The semi-structured interviews were conducted in the volunteer's workshops and questions addressed:

- the Solve volunteer/client/organisation engagement process,
- how the volunteer was briefed by the occupational therapists,
- how the volunteer engaged with the clients,
- the volunteer's way of working on Solve projects, and
- how the final solutions were captured by Solve for reference for future projects.

Whilst the interviews followed a consistent framework of questioning, the semi structured nature of the interviews enabled a free-flowing discussion that could follow responses into new themes to be explored. This style of interview allows the subject more space to ask for clarification on answers and to express free flow of thoughts, and is less intrusive or stressful for the interviewees, and helps the researcher draw objective comparisons.

As semi-structured interviews generally develop qualitative data, in this study a series of agree-disagree questions at the end of the interview allowed researchers to gather additional quantitative data on key themes.

Interview Results

Many hours of interview transcripts have been evaluated and analysed and the findings from this first investigation have been organised below into project focused categories (three stages; pre project, project and post project), and more general operational findings (volunteer and OT focused).

Project focused findings

Pre project stage

Project allocation to volunteers

Volunteers believe that projects are often allocated geographically to allow easy access to clients (for the convenience of volunteers), rather than directly for their skills and aptitude. It is known that the OTs refer to an ‘expertise register’ during the project allocation process, but allocating a project before the client needs and potential project direction are understood, is potentially problematic.

It is considered possible that the allocated volunteer may not be the best person for the project once the client’s needs are fully understood, which suggests the need for an initial ‘project scoping’ client visit to identify the issues and make early determinations on what is required, prior to allocating the project. *[refer to recommendations no.s 15, 20]*

Although the interviewees stated that they accept projects based on the nature of the challenge and their own fabrication capability, they felt a greater need for volunteer selection based on skills and experience (rather than location), with some proposing project ‘teams’ with a mix of skills and capability. This is particularly important for complex or high-risk projects that require a high level of design (user-centred or electro/mechanical systems). *[refer to recommendations no.s 14, 16]*

Clinical briefing

The volunteer briefing which occurs prior to the client visit is fairly brief and typically constrained to a basic project description. The rationale for this is that project scope is often developed in collaboration with the client. At this stage, the OTs haven't met the client or observed them in their own environment, so information is limited to the referral and a subsequent telephone conversation. The briefing is limited to a description of the known limitations of the client (e.g. medical condition/disability and their stated need), but more general clinical information (on that condition) is not supplied.

Some volunteers do their own online research to try to understand a specific condition, prior to meeting the client. A lot of discovery occurs through volunteer observation of the client on the initial visit.

"Clients often think that they know what they need, but volunteers (and OTs) need to define the actual problem. Outcomes can be very different from the brief."

Whilst observation of client and project needs analysis with OTs was identified as the most valuable insight, volunteers felt well supported by the OTs briefing, indicating that it can be a useful 'warning' before the visit.

When it was proposed by researchers that they could be provided with a disability/condition 'fact sheet' prior to meeting the client, the more experienced volunteers felt that they had sufficient experience, but that this would be a valuable resource for newer volunteers.

It was acknowledged that working with people with significant disabilities (especially children) was confronting and can be emotionally demanding. It may be advantageous to expand the clinical briefing to ensure that volunteers are fully cognisant of the challenges of the client's condition and emotionally prepared. *[refer to recommendations no.s 7.8]*

Technical briefing

The current Solve operational process does not include a clear technical briefing. Whilst volunteers feel well supported by the OTs from a clinical perspective, there is little technical support either at the start or during the project.

Volunteers are not provided with suggestions of project direction or prior solutions at the start of the project – "the onus is on the volunteer to 'suss' things out." Whilst this allows for flexibility in the solutions, it also opens the process up to unnecessary replication and operational inefficiencies.

In this instance volunteers are reliant on their own experience, despite being part of an organisation with a significant history of successful assistive technology interventions.

Is there a role for the in-house engineer to attend the initial client visit to scope the project and subsequently provide technical support/ project guidance for complex or high-risk projects? *[refer to recommendations no.s 20, 21,22]*

Project funding

The funding model for the bespoke AT service that Solve provides was changed in 2019. Previously, Solve was funded annually as an organisation and then provided a free service to its clients. Following the establishment of the National Disability Insurance Scheme (NDIS), individual clients are now funded directly through NDIS.

This means that after the initial visit the volunteer must prepare a design proposal and estimated cost that is turned into a quotation that the client submits to NDIS for approval before the project can commence.

There are significant delays in the funding process and approvals can sometimes take six to nine months.

Many volunteers are frustrated by the inherent delays caused by the need for clients to get NDIS funding approval before the

project can commence, and delays are particularly problematic in regard to clients with immediate or evolving needs or degenerative conditions, and children with specific developmental or learning needs.

For small projects, and immediacy, volunteers admitted that they sometimes just do the project straight away at their own expense, but this is not a viable solution for projects with complexity of need or solution. It would be beneficial if Solve was able to hold a small monetary fund for small projects with immediate need. *[refer to recommendation no. 17]*

Project stage

Volunteer methodology

Whilst most projects are unique problems requiring a bespoke solution, it was noted that sometimes projects replicate existing products or components thereof. Volunteers are meant to search for existing solutions, but lack of knowledge of the whole Assistive Technology marketplace and the desire to develop their own solutions may result in unnecessary project work.

It was suggested that too many volunteers typically use familiar or easy to fabricate materials (e.g. wood), rather than selecting a more appropriate material (outside of their expertise).

As Solve does not provide technical guidance in regard to material and fabrication processes, this is unavoidable, however with the Peer Review process for high risk projects and the OTs Safety Review, it is unlikely that this is a major cause for concern. However, this is where design experience is valuable. Should a preliminary project group (comprised of senior volunteers) or an in-house engineer define appropriate materials and fabrication processes, and then select the volunteer based on relevant expertise? *[refer to recommendations no.s 15, 21]*

Team design and volunteer independence

Many of the longer serving volunteers discussed the ‘project team’ approach of regional branches, where groups of volunteers would meet to discuss, scope and allocate projects. This model was considered advantageous, but not appropriate to the larger Melbourne metropolis and the number of projects annually.

It was also noted that volunteers are fiercely independent and like to work out stuff on their own. *"Projects need to be challenging and not trivial for the people who are capable of problem solving."* This notion of volunteer independence is a strength of Solve's operational model, but potentially a vulnerability as well, with claims that it was sometimes necessary to "keep a leash on volunteers who can get carried away." Does this point to a potential conflict between the client's needs, the OTs clinical expectations and the need to keep the volunteer community sufficiently technically challenged?

Whilst some volunteers may be resistant to using prior solutions as a starting point, it was felt that in the absence of technical support, a searchable database of solutions would be a valuable asset.

Digital design and fabrication technologies

Only one volunteer interviewed has experience with digital fabrication (specifically 3D printing) and many volunteers lack the 3D CAD skills necessary to access that technology.

The lack of CAD skills does not necessarily preclude a successful project outcome but does limit fabrication processes, and more importantly the ability to replicate designs for multiple iterations, and to fully document the design outcome for future reference. It may be advantageous for rudimentary CAD training to be made available to volunteers; alternatively, the inhouse engineer (or design/engineering interns) could perform this role. *[refer to recommendation no.11]*

3D printing would be suitable in many project outcomes (as opposed to always doing bespoke hand fabrication) and it allows for fast low-cost prototyping, scalability and multiple design iterations for testing. This technology opens up the possibility for specialised volunteers with CAD skills and 3D printing experience (who may still be in full-time employment) to work more remotely and/or support project volunteers.

It may be advantageous for Solve to consider implementing 3D printing / digital fabrication into design development and testing processes. This could be achieved through a partnership with an external provider.

Universities are typically well equipped with digital fabrication facilities and have a need to provide students with community service and professional experiences. An enabling technical collaboration with universities to gain access to digital design and fabrication technologies may be beneficial. *[refer to recommendations no.18, 25]*

Clinical support - OTs

Volunteers felt that the OTs offer good levels of support from a clinical perspective but that they are not necessarily good at practical (technical) solutions.

However, the role of the OT in the design development process is valued as volunteers don't understand the complex emotional, physiological and rehabilitation aspects of the client's condition and are essential to the interpretation of client needs.

The OTs also conduct the end of project Safety Audit which is critical to ensuring that the built solution is clinically appropriate and safe for the client.

Emotional support

Volunteers do not receive training in sensitivity and dealing with confronting situations, despite the nature of the projects and their interaction with the clients. Working with clients with significant disabilities can be confronting and emotionally demanding, especially with children and clients who have degenerative conditions and may decline through the duration of the project.

Although Solve AT projects are mostly short-term, it's possible for volunteers to have lasting support relationships with clients, thus exposing them to emotional distress.

Training for new volunteers in empathetic dealing with difficult or confronting situations could be introduced into the volunteer induction process. In addition, volunteers may benefit from access to emotional support through counselling as required. *[refer to recommendation no.8]*

Technical support

Typically design direction and project outcomes rely on volunteer experience and are dependent on the volunteer's problem solving and design skills and fabrication capability.

There is not a lot of technical guidance or project oversight coming from Solve except for the high-risk projects where a peer review process is in place.

"There is no tech support"

Volunteers noted that it is rare to receive suggestions re materials or fabrication, and to a greater extent, outcomes are defined by the volunteer's expertise, experience and their equipment.

It was felt that specialist training in advanced fabrication would be useful for volunteers (e.g. training in TIG welding). The availability of such training could add extra project capacity and provide a broader (and possibly more appropriate) pallet of materials and processes, in addition to upskilling volunteers. *[refer to recommendation no.10]*

It was also noted that some volunteers have specialist skills. Whilst it was felt that they should continue to undertake project work, it was suggested that they could also have a role in either training or supporting other volunteers on complex on high-risk projects. *[refer to recommendations no.12]*

Many regional branches have a volunteer committee discussion at start of each project, but the large scale of the Melbourne metropolis makes this scenario less suitable.

However, it is apparent that on specific projects that an initial project appraisal process would be advantageous to define project parameters, select a suitable volunteer and to provide ongoing support to the project volunteer. Should the in-house engineer have a more substantive role in pre-determining core principles for high-risk and/or complex projects? *[refer to recommendation no.21]*

Peer Review process

The Peer Review (PR) process was introduced in 2018 and occurs only on projects identified as complex or 'high risk.' Projects are selected for Peer Review where the assistive technology solution is highly complex, and/or where failure of the product may have negative consequences or present a danger to the client and others.

In the existing process, the onus is on the OT to identify if the project will need a peer review. The OTs can be unsure which projects to assign a review and are dependent on the volunteer to identify project complexity.

The Peer Review process is increasingly important to Solve due to the need for surety regarding product safeness in regard to liability and as a result of the NDIS funding model. The peer review is typically conducted near the end of the project with a panel of experienced volunteers analysing the final built solution. This can result in the volunteer being directed to refabricate the AT with different materials, mechanical systems, safety guards etc.

The experienced volunteers felt that although "some people can resent being told how to do it" especially after the project build was completed, this is a necessary and important process to ensure appropriate solutions that are fabricated for safety and longevity.

It was suggested that the Peer Review could constitute a two-part intervention;

- an initial project scoping review at the early design stage and then,
- a final review of the built solution.

This would have two advantages; one to ensure a more directed approach for high risk projects and secondly, to allow the senior volunteers on the review panel to engage with and mentor volunteers.

Alternatively, the in-house engineer could perform the initial scoping project review as part of the technical briefing process (suggested above). *[refer to recommendation no.20]*

Knowledge sharing database

Volunteers acknowledge that whilst Solve projects are bespoke and specifically tailored to the individual client, there is a commonality across projects through:

- client conditions (e.g. disabilities, impairments and age-related conditions),
- client needs (e.g. reach, mobility, lifting, rotating etc.) and the
- mechanical/technical systems used in the assistive technology solutions (e.g. levers, actuators, springs, sensors, lifting, rotating and locking mechanisms etc).

These are all distinct areas of commonality that could become search categories in a searchable database of prior solutions.

"It's valuable to not always start from scratch."

The interviewees (despite wanting a technical challenge) felt that volunteers could benefit significantly from a cross indexable database, with 'learning from previous projects' being especially valuable to the development and support of new volunteers and driving innovation.

It was also noted that whilst a new system to allow more detailed capture of project outcomes was necessary to ensure a value adding database system, that there was also many decades of projects (and associated knowledge) since Solve's inception in 1975, that should be included in the database, if possible.

Unfortunately, due to inconsistent knowledge capture and archival processes, 'data mining' these resources may be too demanding to be feasible, except for special projects.

It is important to note the value that volunteers put on the 'technical challenge' that projects present; this is often the driving motivation behind volunteering. For a searchable database of prior solutions to be widely accepted by volunteers, it will be important to ensure that it is perceived as a support to volunteers, rather than directing project outcomes.

There are also potential issues of client privacy with volunteer access to previous projects, and any database will need to have names and other potential identifiers removed and replaced by project case numbers.

The use of photos and videos is encouraged as part of the knowledge capture process, but image release approval will be required prior to these being included in a volunteer accessible database, or facial identities masked.

Volunteer skills/expertise register

Solve relies on volunteer expertise, but projects are typically conducted by a single volunteer working in isolation. Volunteers do interact with other volunteers to get help where necessary, but this is achieved either through existing relationships (especially with long serving volunteers) or by asking Solve's Volunteer Coordinator to make the appropriate introduction when specialist skills or equipment are required.

Solve does have a volunteer skills/equipment register, but this is not available to volunteers. Volunteers spoke of the value of an expertise register that they could directly access during a project to search for specific equipment. materials experience, and fabrication expertise amongst the volunteer network. *[refer to recommendation no.6]*

It was also noted that there is no documentation of volunteer creativity, design experience and/or problem-solving ability, just fabrication capability. It would be beneficial to expand the expertise register to include design experience and to identify such volunteers for mentoring and project scoping and oversight roles.

Post project stage

All of the volunteers interviewed found the current project report process either difficult or overly time consuming, with it being noted that many volunteers don't complete the process, nor fully document the project outcomes.

The project report process

The project report task is seen as a procedural requirement rather than a knowledge capture process, with little perceived value. Many volunteers view the project reports as a recording of effort (time) put in, and a recording of project costs (e.g. mileage and materials), rather than a documentation of the solution.

Although some volunteers do provide design documentation (through photos, and/or videos), it is not seen as a common practice for volunteers to supply development sketches or detailed design documentation drawings. Even volunteers with significant industry experience in project and design documentation were disinclined to invest significant time in the report.

"It's just time consuming and you just want to get onto the next project."

It is evident that the Solve quarterly newsletter is an incentive for project report submission with volunteers proud when their AT solutions are featured; this prompting them to put more effort into writing project/outcome descriptions, but these tend towards celebrating the impact of the project, rather than capturing technical information.

Researchers felt that if there was a tangible benefit to volunteers from detailed project documentation (for example a database where they could access prior project knowledge) that there may be an attitudinal shift towards project reporting. But if the report is continuing to be viewed as administrative project closure activity, there was no imperative for volunteers to invest time in the process. *[refer to recommendation no.5]*

Volunteers use a variety of means to submit their project report; email, upload through the intranet and by mail. This reflects a varying degree of confidence with digital systems and should be a consideration in any future knowledge capture system. Whilst advanced upload systems (e.g. through an app) may be the most efficient process, these may be difficult for some volunteers and require greater input from Solve staff to ensure effective knowledge capture.

In addition, volunteers stated that (as they find the current report process laborious) they would like help to fully document the solution. It was suggested that the volunteer could do a brief report with photos, and that if the project was sufficiently complex or unique the in-house engineer (or design/engineering interns) could generate detailed design (CAD) documentation to record the outcome for future reference.

Knowledge capture

The volunteers interviewed felt that Solve captures projects (in varying degrees), but that sharing of knowledge doesn't happen, except when featured in the newsletter (with a photo and a brief project story).

Whilst photographs are an easy record of the completed AT and can be useful to show user-product interaction, it is difficult for photographs to adequately convey the detail of complex or enclosed mechanical solutions.

For an effective knowledge capture and sharing system to be implemented at Solve, it will be essential for minimum expectations to be set regarding what information needs to be captured, for example:

- brief written description of client needs and the AT outcome
- keywords for database search (client impairments, client needs, mechanical /functional/technical)
- photos and video of client-AT interaction (with appropriate client release)
- photographs of all stages of the development fabrication, and final product build (including component and assemblies/ disassembles)
- design documentation drawings (preferably CAD)
- documentation of mechanical/technical system design (inc. force/load calculations)
- specification sheet of materials and components used (pref. with supplier part no.s)

[refer to recommendations no.s 1, 2]

It might also be beneficial for a 'reflection' section to be included in the reports. This may help establish a culture of critical analysis, to guide future projects and aid the development of new volunteers.

Operational - general findings

The dominant volunteer demographic is that of a retired male, with an engineering or fabrication background.

Volunteer profile

70% of volunteers are in their 60s or older, 20% in their 50s and there are less than10 volunteers in their 30s.

There are only a few female volunteers, and they either assist in the office, or contribute upholstery work to projects run by other volunteers. This appears to be a legacy of the initial engineer founded organisation, however, there appears a need for the proactive recruitment of female volunteers. *[refer to recommendation no.19]*

Volunteer motivation

It appears from the interviews that the main motivations for Solve volunteers are the ‘technical challenge’ presented by the project, and the reward of helping others in need. It is therefore important that the ‘technical challenge’ is maintained.

“The way to attract volunteers and keep them happy is to give them challenges that they get kicks out of problem solving.”

Volunteers don’t want ‘make this’ instructions, but also see the futility of constantly ‘reinventing the wheel’ and would appreciate more technical support from Solve during design development.

“We are not collectively assistive technology experts; volunteers are people with skills who are prepared to adopt another person’s problem and make it their own.”

Volunteer knowledge

Most of Solve’s innovative project solutions are:

- unique and specifically tailored to the individual client’s needs, and
- designed and fabricated according to the specific aptitude and experience of the volunteer involved.

As a result, the many years of acquired knowledge tends to be held at the volunteer level, rather than at an organisational level, where it could be shared and disseminated as required. There was also recognition of the aging nature of the volunteer community and the necessity of ensuring the capture of expert knowledge from the older volunteers, to:

- alleviate the operational vulnerability from knowledge loss within the organisation, and
- support the next generation of volunteers.

Although Solve holds many years of historical project records, this information is filed in a manner that precludes easy searching and is not accessible by volunteers. Accessing in-house knowledge is too heavily reliant on individual memories (volunteers and OTs), rather than a collective organisational resource.

Volunteer recruitment and training

It was suggested by the more experienced volunteers, that volunteers need to have design and creative problem-solving experience, not just making skills.

Whilst many volunteers are retired engineers with significant mechanical system design and risk analysis experience, volunteers solely with fabrication skills may be less capable on complex projects and may be overly reliant in material familiarity and their individual fabrication capacity, rather than taking a holistic (and client centred) approach.

Whilst volunteers have the best intentions in regard to helping clients, it may be advisable to introduce a recruitment selection strategy and/or a volunteer training program to complement/ expand the existing expertise.
[refer to recommendation no.19]

Ongoing training for volunteers could broaden capabilities and ensure a client/project focused rather than volunteer focused solution. It is understandable that volunteers will work with materials and processes that they are experienced and comfortable with, but this can introduce limitations in terms of the suitability of the final outcome.

It was also noted that whilst the engineering and production fields are well represented across the Solve volunteer community, there is less representation from the design professions. Designers have a human-centred approach with expertise in user-product interaction, and in the social and emotional aspects of design. Could there be scope for more design intervention? Do volunteers require mentoring in design? *[refer to recommendation no.13]*

In addition, there are new digital fabrication processes available, for example subtractive manufacturing (CNC lathes, mills and routers) and additive manufacturing (3D printing) that would expand capabilities, enable more design iterations and fats prototyping for testing and evaluation.

Whilst these technologies are outside of the experience of many existing volunteers and require computer aided design (CAD) skills, nevertheless they offer many benefits to the existing project methodology. It is suggested that Solve should actively seek to recruit volunteers with specific skills and experience in digital design and fabrication. *[refer to recommendation no.19]*

Occupational Therapists (OTs)

The TADVic organisation (now Solve) was started by technical people, but they soon realised that they lacked the clinical knowledge to accurately define client needs and ensure appropriateness of solutions. Occupational Therapists became an integral part of the service provided, providing the clinical expertise and understanding of the use of assistive technologies in aiding those with disabilities and impairments.

Whilst all interview subjects were highly appreciative of the clinical expertise of the OTs and their role in realising appropriate solutions for clients, there appear to be some lingering cultural conflicts between the engineering focused (elder male) volunteers and (younger female) OTs.

"A lot of volunteers would rather work with a fellow engineer than an OT – speak the same language."

Volunteers stated that the OTs weren't looking from a technical perspective and that they may not have mechanical comprehension. They surmised that this could result in failure to identify project complexity or the allocation of projects to volunteers who may not be sufficiently proficient for the design challenge – "some volunteers can be out of their depth, but OTs may not identify this".

It was also noted that some volunteers could tend towards overly complex solutions (above what was necessary to meet the client's needs) so may need to be 'reigned in' by someone with a more technical (mechanical systems design) background who could propose alternative approaches.

It would appear beneficial for both OTs and volunteers to have more technical support. *[refer to recommendations no.s 9, 20, 22]*

In-house engineer

The role of the (part-time) in-house engineer was unclear.
The position is currently part-time and is an independently funded position and a new relatively initiative.

Researchers found it difficult to define the responsibilities of the role and the touchpoints of the engineer throughout the Solve operational model. This may be in part due to the relative newness and temporary nature of the position, but it was apparent that the role had far greater potential that was currently being utilised.

Volunteers would value the opportunity to discuss project issues and proposed solutions with someone who has similar technical training and expertise. In addition, from a quality assurance perspective, it would appear that Solve should have a more clearly defined oversight on complex or high-risk projects throughout the project (not just through the peer review process at the end).

There also appears a need for enhanced project scoping, guidance and volunteer support, and a more comprehensive knowledge capture process to ensure that the AT expertise is held within the organisation (rather than within the volunteers).

It suggested that the role of the in-house engineer should be expanded in several ways:

- conducting initial project assessment and scoping,
- identifying suitable volunteers for the project,
- identification and oversight of complex or high-risk projects,
- providing technical guidance and support to the OTs,
- providing training, mentoring and technical support to volunteers,
- directing the Peer Review process, and
- responsibility for ensuring accurate knowledge capture (including the generation of CAD documentation and technical specifications).

[refer to recommendations no.s 20-25]

Stakeholder engagement

Volunteers noted that sometimes there can be too many stakeholders in the project; not just the end user, but also carers, teachers, nurses etc. They also spoke of a ‘pecking order’ in medical environments and identified that multiple stakeholder engagement can be problematic. Whilst researchers were not provided with specific instances where this had been a concern, it did suggest that in these instances that engagement boundaries should be established, with OTs and the in-house engineers being the intermediaries, between external stakeholders and the volunteer.

Agree-disagree questions

Interviews concluded with volunteers asked a series of agree-disagree questions. These served to summarise the large quantity of qualitative data collected and to identify key areas for further investigation.

Initial volunteer briefing

Interviewed volunteers were satisfied with their initial briefing with100% agreeing with the question “I receive a thorough briefing by SOLVE before I start a client project.”

Prior solutions

As identified earlier in this report, volunteers do not have access to a knowledge data base of previous projects with 83% disagreeing with the question “I’m provided with information regarding prior solutions to similar client needs.” The remaining interviewees clarified their response with ‘sometimes’ rather than agreeing or disagreeing.

Clinical briefing

All interview subjects agreed with the question “I am provided with sufficient clinical information to understand the condition and or impairment of the client“ but many clarified their responses by stating that they were including the observational visit with the client as part of the briefing.

Volunteer support

83% of interviewees felt “well supported by the Occupational Therapists and other SOLVE staff during the project.” This response data suggests a supportive culture across the organisation and supports the effectiveness of the OTs and the Volunteer Coordinator in engagement. However, this result is at odds with statements made by volunteers in regard to the lack of technical support throughout the projects.

Project report

Only 67% of interviewees agreed with the question “I always document my projects in the project report” with the remaining equally split between disagreeing (not completing the report) and “sometimes.” However, all interviewees agreed that “the process of capturing design development and documenting the final solution is difficult and time consuming.”

Agree-disagree resutls

I receive a thorough briefing by SOLVE before I start a client project.

AGREE: 6 (100%) DISAGREE: 0

I'm provided with information regarding prior solutions to similar client needs.

AGREE: 0 / SOMETIMES: 1 DISAGREE: 5 (83%)

I am provided with sufficient clinical information to understand the condition and or impairment of the client (including client visit).

AGREE: 6 (100%) DISAGREE: 0

I feel well supported by the occupational therapists and other SOLVE staff during the project.

AGREE: 5 (83%) DISAGREE: 1

I always document my projects in the project report.

AGREE: 4 (67%) SOMETIMES: 1 DISAGREE: 1

The process of capturing design development and documenting the final solution is difficult and time consuming.

AGREE: 6 (100%) SOMETIMES: 0 DISAGREE: 0

Volunteer Survey

Stakeholder meeting

Following the interviews and an initial review of findings a follow up meeting was held at Solve with the OTs and operational staff. Of particular interest to researchers was induction and mentoring, the peer review process, technical support and volunteer networks.

Following the additional discovery meeting, researchers proposed an online survey of volunteers to ensure that the interview findings were representative of the broader volunteer community. Initially the survey was wide ranging in its questioning, but after consultation with Solve, the questions were reduced in scope to focus more on the initial research questions, namely volunteer support, and knowledge capture and sharing.

Solve agreed to distribute the link to the anonymous survey by email to the volunteer community.

Volunteer survey

The anonymous online survey resulted from early analysis of interview results and aimed to ensure that the opinions expressed by interview participants were reflective of the overall volunteer community.

Participants were asked a total of 17 questions that aimed to understand their motivations for volunteering for Solve, and their satisfaction and needs with regard to Solve processes including clinical briefing, technical support, mentoring, project knowledge capture/design documentation and submission, and their opinion regarding the value of a proposed expertise register and searchable database of prior solutions.

Responder profile

The survey attracted 20 responses, 70% of which were highly experienced volunteers with more than 10 years of service with Solve. Only 5% of responders had less than 5 years, and there were no new volunteers amongst those who completed the survey. It was unfortunate that the newer or less experienced volunteers were so poorly represented as with an aging volunteer community, it is critical that the newer volunteers have a voice and agency.

Whilst the responders bring a vast experience of Solve current and historical operational models to the conversation, they are less likely to benefit from (or seek) either mentoring or technical support.

Survey results

Volunteer motivation

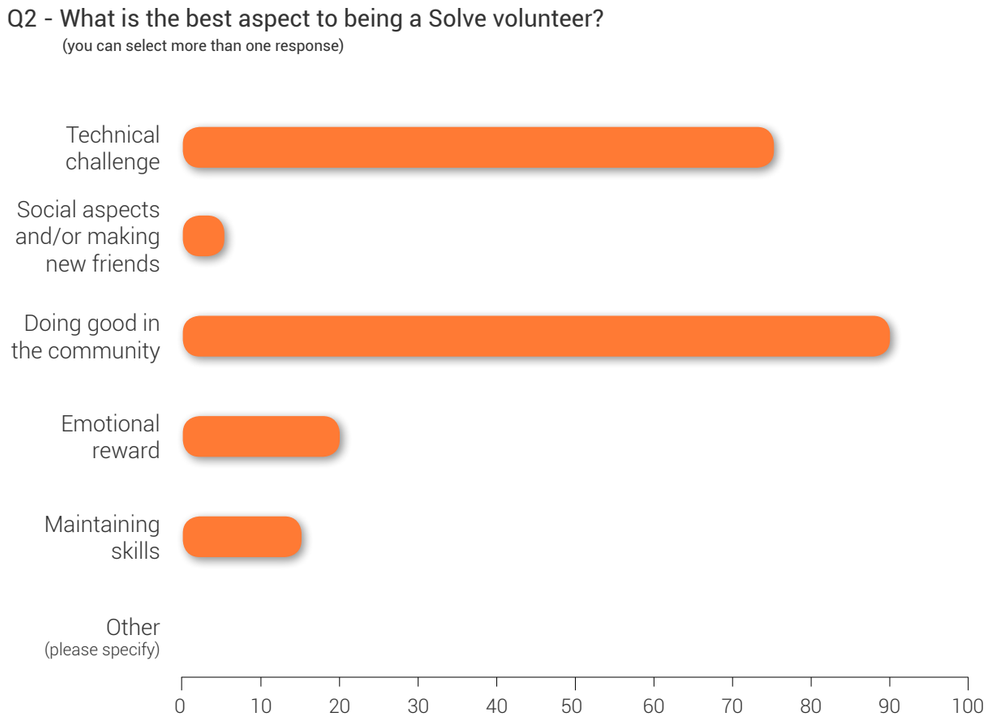
The survey reinforced the interview findings with regard to the motivation for volunteers to engage with solve projects. The survey provided the opportunity for volunteers to select from a range of motivators and overwhelmingly volunteers chose the 'technical challenge' (75%), and 'doing good in the community' (90%).

Of less importance to volunteers was the 'emotional reward' (20%) and 'maintaining skills' (15%). Only 5% of respondent volunteers selected 'social aspects', which reinforced the impression gained from interviews that the Solve project is seen as a solitary pursuit.

Clinical briefing

Volunteers were asked 'do you ever feel the need for a greater understanding of the client's disability and its impacts before meeting the client, especially in the case of severe disability, degenerative conditions, disabled children etc?'

85% of responders agreed, although most of these indicated that this was only necessary sometimes. In open-text responses, volunteers offered that they try to understand the client's limitations prior to the meeting. One responder also noted the potential risk (to the volunteer) with regard to exposure to bodily fluids and disease transmission and would prefer to receive a clear briefing in this regard.



Technical support

Volunteers were asked if they access technical support from Solve. 58% of responders indicated that they will consult with other volunteers, which reflects the more connected network that experienced volunteers possess. This result may greatly differ if a larger quantity of less experienced volunteers had completed the survey.

21% of all responders (and 50% of newer volunteers) indicated that they have consulted with the in-house engineer, although these responders noted that this service has only recently become available.

One highly experienced volunteer offered in open text that he would be unlikely to consult with the engineer as he was an engineer himself and wanted to do the problem solving. This response highlights a potential cultural problem within the volunteer community,

where the ‘technical challenge’ is a key volunteer motivator, and volunteers have self-identified as fiercely independent.

Volunteer mentoring

The survey asked volunteers whether ‘a mentor scheme where new volunteers are paired with an experienced volunteer for the first project would be beneficial?’ All agreed with 30% indicating ‘always’ and 70% sometimes – depending on the new volunteer’s experience.

Volunteer workload / project acceptance

The OTs have observed a reluctance by some volunteers to decline projects, even if they don’t have time to complete them in a timely fashion.

This behaviour has caused delays to some projects and was evident in the survey with 30% of volunteers indicating that they will always accept projects even if too busy. This could be due to either:

- a dedicated workforce who don’t want to say no to those in need, or
- volunteers relying on NDIS funding delays to allow them to be available for the project

Volunteer expertise register

75% of responders agree that a ‘volunteer accessible’ register of the specific skills, expertise and equipment of other volunteers would be valuable.

Knowledge capture

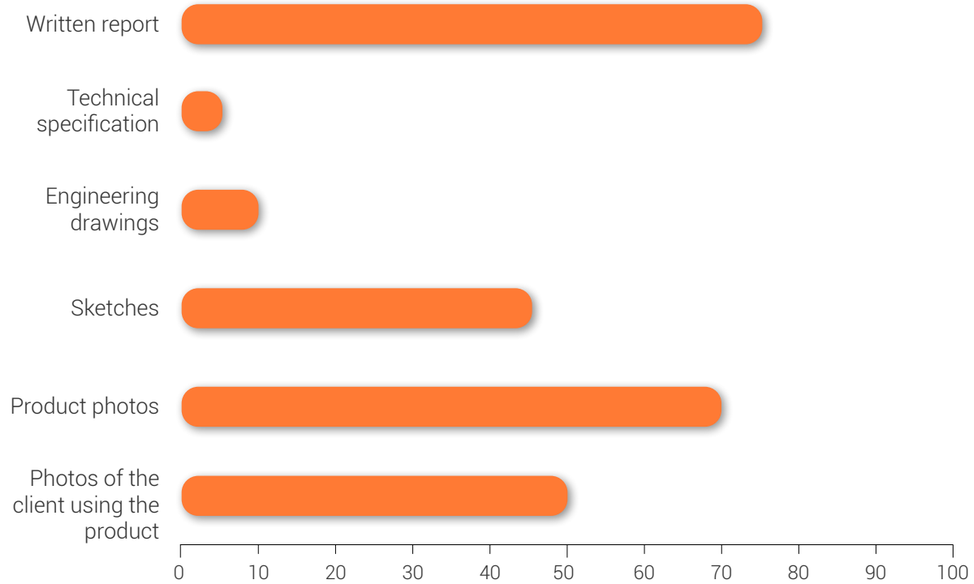
Volunteers were asked a series of questions regarding the existing project report process.

When asked whether they completed the report, 70% responded ‘always,’ with 30% ‘sometimes’ with the open text clarifications that they “dislike paperwork” or that they intended to, but ‘don’t follow up’.

When asked how they document the final solution, the written report was the most common (75%), with 70% supplying product photos or photos of the client using the product (50%). 45% responded that they include sketches (which was not evident during the interviews).

In terms of technical documentation, only 10% submitted engineering drawings, and only 5% submitted a technical specification.

Q7- How do you document the final solution? with photos, drawings and technical description?
(you can select more than one response)



These findings highlight the need for a standardised knowledge capture system with detailed capture of the engineering details of the final solution, a format that can be used to benefit future projects of a similar nature.

95% of responders did not feel the need for help to fully document the final solution (as per existing project report requirements).

However, it is likely that if a system requiring engineering documentation and a higher level of project capture is implemented, that this may change.

Of the survey responders, 60% submitted their project reports by email, 20% by hard copy and only 20% used the online submission portal through the Solve intranet. Of those who submitted online, all found the portal easy to use, with 75% finding it time efficient.

There appears to be some resistance to digital technologies amongst the volunteer community, with poor utilisation of the existing portal and disinterest in suggestions of an app-based system for knowledge capture. Volunteers will need training and familiarisation, to ensure successful implementation of any future knowledge capture/sharing system.

Knowledge sharing

Volunteers were asked if they would like access to a searchable database of Solve project solutions where they could reference existing designs for previous solutions for similar disabilities or client needs, and/or common mechanical systems.

90% of responders indicated that that would be a good reference point for projects, with 95% agreeing that such a database would be a useful way to support volunteers to work more efficiently and effectively.

Volunteers indicated that the most useful aspect of a searchable database would be referencing previous design for similar solutions to:

Client focussed

- Client needs (75%)
- Disabilities (52%)
- Age related conditions (21%)

Design/fabrication focussed

- Materials (57%)
- Functionality (48%)
- Fabrication processes (48%)
- Mechanical systems (42%)
- Electronic / digital control systems

Survey summary

The survey results reinforced the interview findings and achieved its aim of canvassing a wide cross-section of the volunteer community to ensure that interview findings were broadly representative. Survey results supported researcher's initial findings in regard to:

- the need for a standardised knowledge capture system,
- the value of a knowledge sharing searchable database,
- the importance of maintaining the technical challenge for volunteers,
- the benefits of a more extensive clinical briefing (pre-client visit, as required),
- the value of a volunteer accessible expertise register,
- the need for greater technical support for volunteers.

Summary of Key Research Findings

This study aimed to investigate three research questions:

- Could Solve better support volunteers through the availability of clinical knowledge and prior solutions (from knowledge capture)?
- Does Solve require a new or enhanced knowledge capture system to ensure that design solutions, specialist knowledge and expertise are held within the organisation?
- Would a volunteer accessible expertise and knowledge sharing database support volunteers and lead to enhanced operational efficiency and expediency?

The findings of the study supported the premise of the research questions.

Volunteers felt there were many areas where they could be better supported, through access to existing organisational knowledge (clinical briefing, expertise register and prior solutions database), and through project technical support, training and mentoring.

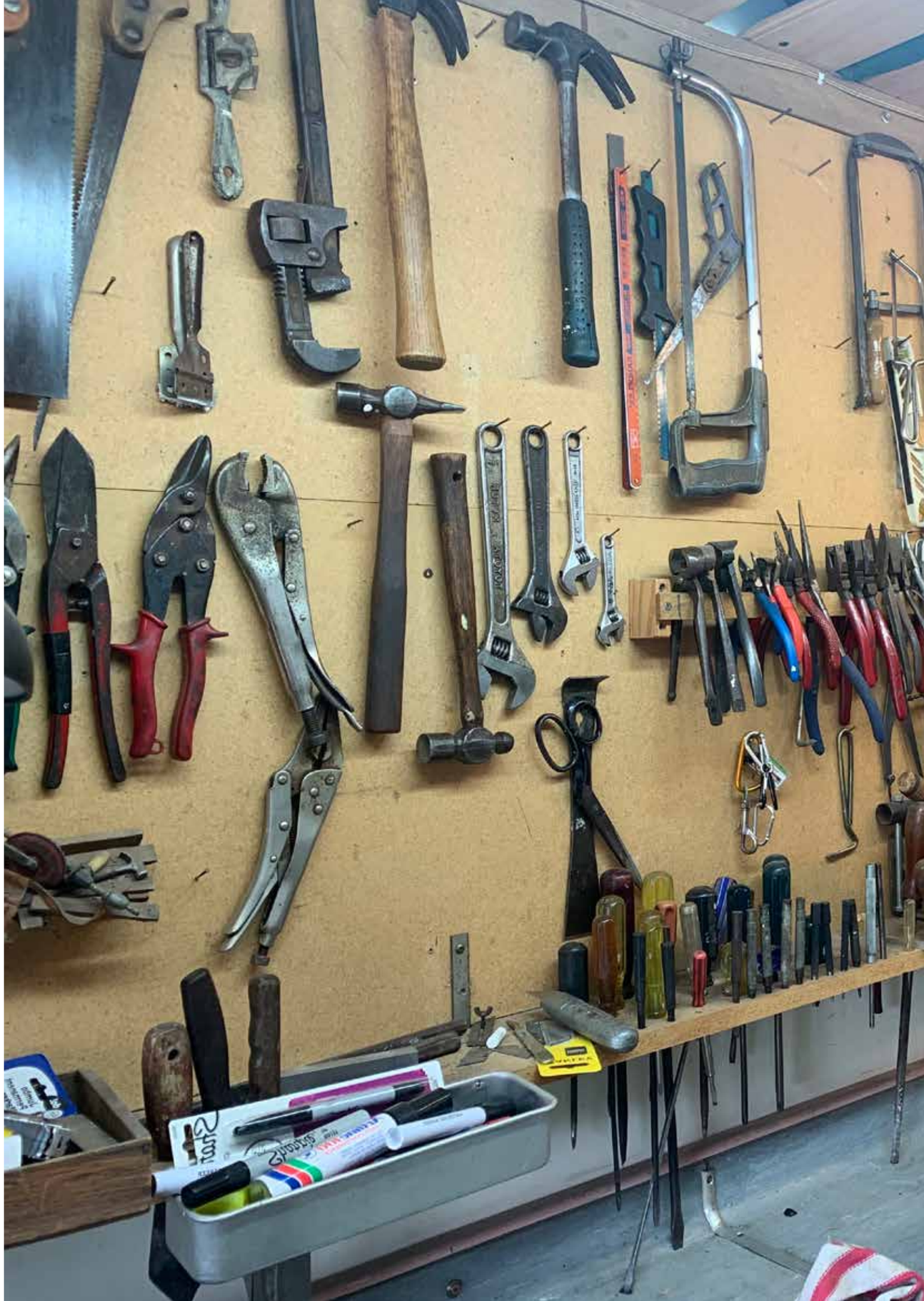
The proposal for the establishment of a knowledge capture/ knowledge sharing database that contained project documentation was well supported, as was the need for volunteers to have access to a volunteer expertise register.

In addition to the primary focus of their investigation, researchers also identified a range of operational needs or potential enhancements specifically relating to volunteer support and the role of the in-house engineer. Whilst these sit outside of the original scope of the research, there were considered valuable insights, and additional recommendations have been made in response to those findings.

Recommendations (in the following section) are grouped into four categories:

1. Knowledge capture / Knowledge sharing
2. Supporting volunteers
3. Operational procedures
4. Role of in-house engineer

In addition, the recommendations have been mapped into a revised stakeholder journey map which incorporates recommended operational procedures and illustrates new or revised stakeholder responsibilities and contributions.



Recommendations

The following recommendations directly result from the research findings and are offered as promptings to improve the operations of Solve Disability Solutions.

As Solve is so heavily reliant on volunteer goodwill, it is suggested that these recommendations are workshopped with all stakeholders, to ensure an inclusive implementation process and volunteer acceptance of new procedural systems. However, it is also important that volunteers understand Solve's obligations to both clients and the NDIS and that they are accepting of the need for changes in response to a new operational and funding environment.

Knowledge capture / Knowledge sharing

A searchable digital database (of prior project solutions and volunteer expertise) has been identified as a necessary resource to support volunteers and ensure effective and efficient project procedures. Capturing project outcomes in detail, will not only aid volunteers, but may be beneficial in regard to product liability and/or future NDIS reporting requirements.

1. Establish a digital database for collection, storage and retrieval of project knowledge (see Appendix 1 for operational guidelines)

2. Standardise the project documentation/knowledge capture process – this should include CAD engineering drawings and technical specifications, not just photos

3. Examine the role of the in-house engineer in ensuring adequate technical documentation

4. Run training sessions for volunteers to gain familiarity in the use of the database system

5. Extol the benefits of and provide incentives for volunteers to complete thorough project documentation

6. Incorporate the existing volunteer expertise register into new database system and allow volunteer access (with appropriate privacy measures)

Supporting volunteers

The research identified many aspects where volunteers could be better supported, either in the briefing stage, during the project, or in post project knowledge capture.

Clinical /Emotional

7. Develop ‘fact sheets’ for specific disabilities and impairments to aid volunteer understanding prior to the observation visit

8. Ensure training/ awareness/ emotional support for volunteers dealing with difficult or confronting impairments/conditions, or risky situations

Technical support / Training

9. Establish robust technical support through involvement of the in-house engineer and project teams in complex and/or high-risk projects

10. Offer specialist training in advanced fabrication techniques

11. Offer rudimentary CAD training to volunteers to facilitate project documentation

12. Identify volunteers with specialist skills and deploy them in training and/or support roles

13. Offer mentoring in design and complex problem solving

Operational

The investigation revealed operational areas that could be enhanced

14. Select project volunteer based on skills and experience (rather than location)

15. Conduct initial ‘project scoping’ client visit before volunteer appointed - materials and process to be defined - this will guide volunteer selection

16. Adapt a ‘project teams’ approach for complex or high-risk projects

17. Maintain a small monetary fund for use on small projects with immediate need.

18. Introduce 3D printing and digital fabrication technologies (possibly through industry partnership)

19. Initiate proactive recruitment of female volunteers and volunteers with CAD/ digital skills and digital fabrication experience

Role of in-house engineer

The in-house engineer is a relatively new (part-time) position and did not appear to be well defined. The research identified several areas where this role could be expanded to make a stronger contribution in technical oversight and support, volunteer mentoring and training, and knowledge capture.

20. Engineer to accompany OT on initial meeting with client for project scoping

21. Engineer to have a more substantive role in pre-determining core principles for high-risk and/or complex projects

22. Engineer to provide technical support and project guidance for complex or high-risk projects, and direct the Peer Review process

23. Engineer to establish standardisation of project documentation and oversee implementation

24. Engineer to take responsibility for ensuring accurate knowledge capture (including the generation of CAD documentation and technical specifications)

25. Industrial design and/or engineering interns to be employed to support engineer role - these could be industry sponsored positions.

Revised stakeholder touchpoint map

The following stakeholder touchpoint map (over page) has been revised to show the implications of research finding and the recommendations in this report.

Key revisions include:

- an extended/amended project journey to capture new service touchpoints including knowledge exchange and knowledge capture,

- an expanded and more clearly refined role for the in-house engineer, in particular in regard to oversight throughout complex or high-risk projects, and in the knowledge capture process,

- a new stakeholder role for a design or engineering student intern, who would assist the engineer and volunteer with knowledge capture (specifically CAD and engineering and specification documentation), whilst facilitating access to University digital fabrication resources, and

- additional volunteer support throughout the project and in knowledge capture.

SOLVE Disability Solutions

Touchpoint **Map**

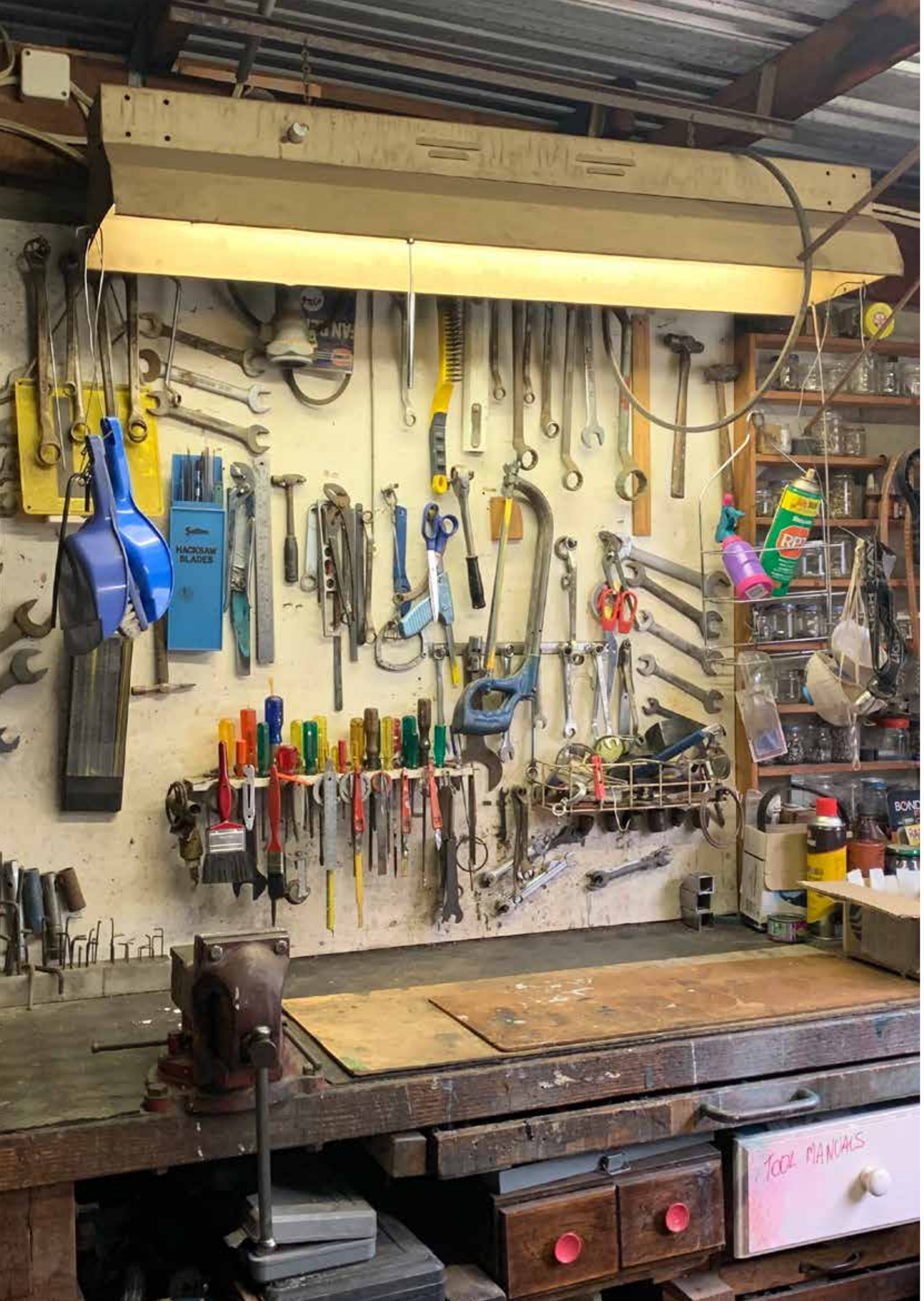
Journey **Phases**

- Initial Consultation
- Project Development
- Making & Testing
- Finalisation

Client **Steps**

- Identify need for Assistive Technology
- Reach out to services
- Participate in various assessments
- Submit application for funding
- Funding approved through NDIS
- Participate in testing and feedback
- Receive bespoke Assistive Technology

Service **Touchpoints**



Conclusion

Solve has had significant success in helping those in need with appropriate bespoke Assistive Technology Solutions, fabricated and engineered to a high level.

The organisation has been (and will continue to be) dependent on the goodwill of the volunteer network, who share their skills, time and equipment to address the specific needs of individual clients.

However, the introduction of the NDIS and the changing funding landscape will require some operational changes. The linking of funding to individual projects through the client's allowable funding, rather than at an organisational level is challenging and may eventually lead to a higher level of accountability and liability for Solve. Whilst at present there is limited post-project auditing by NDIS, this may change, and the need to ensure thorough project documentation may be of utmost importance.

The volunteer network, whilst the backbone of the organisation, is aging and it is essential that the significant knowledge that is currently held by volunteers is transferred to the organisation, lest it be lost. There is a very real and immediate need for standardisation of project documentation and the implementation of a knowledge capture / knowledge exchange system.

The organisational need to keep volunteers happy and well supported, does not contradict the imperative for Solve to introduce new operational procedures and requirements of volunteers, despite entrenched volunteer behaviours. The increasing oversight of NDIS across client projects may demand more robust and accountable systems than previously.

It is very possible that projects will need to be documented thoroughly for auditing and liability purposes, rather than for celebratory or record keeping purposes.

A proper system of knowledge capture and exchange will also be of immense benefit to volunteers once they let go of their ‘fiercely independent‘ mentality and realise that they are part of an organisation that has both responsibilities and culpability, and a need for a more centralised system with more clearly defined project oversight, to drive innovation, efficiencies and deliver impact to the client.

Next Steps

1. Co-creation workshop

Following review of this report it is suggested that Solve and RMIT researchers conduct a co-creation workshop to engage all stakeholders in the change management process. There appears to be some degree of inflexibility and adherence to old procedural systems within the volunteer community and these workshops will be invaluable to establish priorities and implementation strategies, and to ensure staff and volunteer agency and commitment.

2. Implement Operational / Procedural recommendations

Review project touchpoint mapping and recommendations and develop appropriate actions to implement changes as required.

3. Seek Philanthropic funding

Development of a fully operational and robust Knowledge Capture/ Knowledge Sharing system will require a significant amount of work, and therefore will need additional funding. As Solve does not have direct organisational funding and instead supports its operational costs through individual projects, it is unlikely that there will be sufficient funds to employ a professional service to build the system.

It is anticipated that should Solve decide to pursue the recommendations and establish such a system, that philanthropic funding will need to be sought. It is proposed that RMIT researchers' partner with Solve to seek philanthropic funding to enable the implementation of the Knowledge Capture / Knowledge Sharing database system.

Funding should be sufficient to enable:

- the development of the system platform,
- translation and transfer of existing knowledge (from archived projects) into the database system, and
- staff and volunteer training as required to ensure a successful operational transition.

4. Develop knowledge system

Following receipt of funding, a RMIT–Solve partnership will develop the framework and associated protocol and actions to create a digital database that will facilitate collection, storage and retrieval of project knowledge and volunteer expertise.

Through the partnership with RMIT, the project should leverage the existing expertise within RMIT to ensure that the realisation of a well designed, robust and user-friendly knowledge capture and exchange system.

Appendix 1:

Knowledge Capture / Knowledge Sharing for SOLVE – draft proposal/operational guidelines

Volunteer Engagement

A co-create workshop is proposed to develop the knowledge capture and sharing system. Engagement in the development process will be a key factor in assuring volunteer acceptance of a new operational system.

knowledge capture - minimum expectations for information capture are:

- brief written description of client needs and the AT outcome
- keywords for database search (client impairments, client needs, mechanical /functional/technical)
- photos and video of client-AT interaction (with appropriate client release)
- photographs of all stages of the development fabrication, and final product build (including component and assemblies/ disassembles)
- design documentation drawings (preferably CAD)
- documentation of mechanical/technical system design (inc. force/load calculations)
- specification sheet of materials and components used (pref. with supplier part no.s)

Knowledge Sharing

a database of AT project outcomes and volunteer expertise searchable by keywords distinct areas of project commonality that could become search categories in a searchable database of prior solutions.

Client focussed

- client conditions (e.g. disabilities, impairments and age-related conditions),
- client needs (e.g. reach, mobility, lifting, rotating, eating etc.)

Fabrication focussed

- materials
- fabrication processes (e.g. TIG welding, sheet steel, 3D printing, machining, routing)
- product functionality
- mechanical/technical systems (e.g. levers, actuators, hydraulics, springs, sensors, lifting, rotating and locking mechanisms etc)
- electronic / digital control systems

Volunteer focused

- a volunteer expertise register
- e.g. equipment, material experience, fabrication experience/ skills, engineering/design/problem solving ability, CAD skills, digital fabrication exp. etc.

References

World Health Organisation (2018) Assistive Technology fact sheet. Retrieved from: https://www.who.int/news-room/fact-sheets/detail/assistive-technology

Layton, N. & Callaway, L. (2017, April). ARATA's response to the Senate inquiry into the delivery of outcomes under the National Disability Strategy (2010-2020). Silvan, Victoria: Australian Rehabilitation and Assistive Technology Association. Retrieved from: https://www.arata.org.au/public/33/files/General%20information/arata_response_NDIA_AT_discussion_paper_27022015.pdf

National Disability Insurance Scheme (2015) Assistive Technology Strategy. Retrieved from: https://www.ndis.gov.au/about-us/strategies/assistive-technology-strategy

National Disability Insurance Scheme. Assistive Technology Specialised (Level 3) and Complex (Level 4) Easy English booklet. Retrieved from: https://www.ndis.gov.au/participants/home-equipment-and-supports/assistive-technology-explained

National Disability Insurance Scheme. Participant Fact Sheet – Specialised (Level 3) and Complex (Level 4) Assistive Technology. Retrieved from: https://www.ndis.gov.au/participants/home-equipment-and-supports/assistive-technology-explained

National Disability Insurance Scheme (2017) Assistive Technology (AT) Complexity Level Classification. Retrieved from: ndis.gov.au