



# PROJECT REPORT

## **1. Project Title:**

Pilot Study: The Role of Computer Adaptive Technology in the Employment of Those with Brain Injury

## **2. Brief Description of Project:**

This is a pilot study, using a case study methodology to identify the possible role for adapted computer technology in assisting the employment of people with brain injury. Ability staff worked in cooperation with staff from two job placement agencies that specialise in the placement of people with brain injury. Our involvement, in the form of technology assessments and advice, was offered as a free service to the clients, agencies and relevant employers.

## **3. Start Date and Duration of the Project**

The project commenced in July 2004 and was completed in December 2005, a duration of 18 months.

## **4. Funding Provided by the MAA**

The MAA contributed \$10,000 to the cost of this project. On our estimates this represented approximately 60% of the cost of the project.

## **5. Objectives of the Project**

The aim of the research was to test the following two hypotheses:

- i. That adapted computer technology can assist people with brain injury to gain employment.
- ii. That adapted computer technology can assist people with brain injury to retain existing employment.

## 6. Implementation of the Project

- (a) Literature Review: A substantial review was undertaken at the commencement of the project and updated continuously throughout the project. It shows there has been increasing interest in the literature on the topic of assistive technology and brain injury, especially with regard to personal digital assistants (PDAs). However there has been very little study of the impact of this technology on the employment of people with brain injury.
- (b) Review of Technology Options: The Ability team reviewed the adaptive tools that we have previously used for clients with brain injury. These are summarised below:

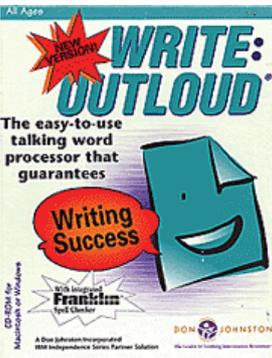
### HARDWARE:

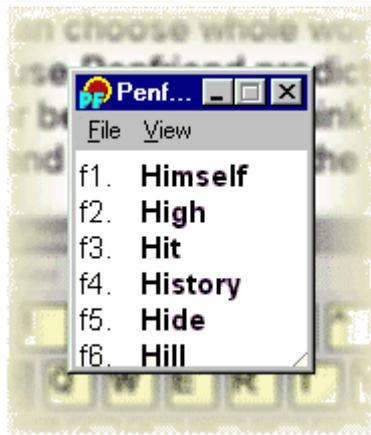
	<p><b><i>Switch-Adapted Mouse</i></b> <i>Overcomes tremor when attempting to click a mouse button.</i></p>
	<p><b><i>Trackball</i></b> <i>Requires less fine motor control than a mouse. Kensington Expert Mouse Pro Trackball shown; other types available.</i></p>
	<p><b><i>KidTRAC</i></b> <i>Has coloured buttons, for easier discrimination. Also requires no software, facilitating use in a network environment.</i></p>

	<p><b>Traxsys Joystick Mouse</b>  <i>More intuitive to use than a mouse or trackball.</i></p>
	<p><b>Cherry Compact Keyboard</b>  <i>Facilitates typing with one hand.</i></p>
	<p><b>Intellikeys Keyboard</b>  <i>A programmable keyboard used mainly in schools but has potential for use in a work situation. Overlays can be designed for each situation, including the use of pictures to replace or supplement text.</i></p>
	<p><b>BigKeys Keyboard</b>  <i>Has large keys, colour available, ABC or QWERTY layout. Assists with tremor and visual discrimination.</i></p>
	<p><b>Macro Keypads/Keysticks</b>  <i>These enable hard-to-remember key sequences to be stored under one programmable key.</i></p>

	<p><b>Half Keyboard</b></p> <p><i>Useful for one-handed typing, Gives access to all key functions from just one side.</i></p>
	<p><b>PDA</b></p> <p><i>These devices have alarm functions, to aid memory, and an intuitive interface. Portable databases can also be installed. Some combine phone functions.</i></p>
	<p><b>Touch Screen</b></p> <p><i>A very intuitive method of computer access, although can be physically demanding</i></p>

**SOFTWARE:**

	<p><b>Write:Out Loud</b></p> <p><i>One of several programs that speak back letters, words and/or sentences, as they are typed. This gives confirmation to the user.</i></p> <p><i>These programs can also be used to read text aloud, to assist with reading.</i></p>
---	---



**Penfriend**

*One of several options that provide word prediction options for the user.*



**Discovery Desktop**

*In some cases a simplified desktop interface can avoid confusion that arises from the standard desktop.*



**Pocket Coach**

*Provides verbal prompting to complete a sequence of tasks. Runs on a PDA. A version is also available that provides visual prompts as well.*



**Standard Programs**

*These can be adapted to provide support for people with brain injury. WORD can be customised and simplified. EXCEL can be used to create simple budgets and other tools. A DATABASE can be used to store and retrieve information.*

- (c) Assessment Tool, Project Description Sheet and Referral Sheet: These were designed in the early stages of the project and used throughout.
- (d) Meetings with Job Placement Agencies: These meetings were conducted in July 2004. Both had already agreed to be part of the project. The purpose of these meetings was to explain the project to them and to demonstrate some of the available technology options. We also invited them to nominate suitable clients for the project.
- (e) Selection of Participants: Our original plan was to select six participants from those nominated by the agencies. However by 30 September 2004, in spite of numerous follow-up calls, we had received only five nominations in total. We decided to proceed with these five, for fear of delaying the project substantially.

But when we sought to follow-up the five clients who had been nominated, we found that several of these had already moved through the system. In addition, we had to correct a misunderstanding on the part of the job placement agencies that our technology would only assist people who were seeking IT-based jobs, when in fact it applies to a much wider range of jobs.

From this period onwards we realised that we would be struggling to make up the numbers for the project and still meet the proposed deadlines. We redoubled our efforts and over the ensuing months a total of six participants were nominated for and included in the project. We continued to approach both agencies up until September 2005, but were unsuccessful in attracting any further nominations.

- (f) Assessments of Clients' Technology Needs: Assessments were undertaken of useful technologies for the following clients<sup>1</sup>:

NAME	AGE/GENDER	EMPLOYMENT	DATE OF ASSESSMENT
Robert	37 M	Job lined up	21 October 2004
Richard	36 M	Employed	2 November 2004
Trudy	40 F	Seeking work	1 December 2004
Penny	48 F	Seeking work	7 December 2004
John	27 M	Working	7 February 2005
Peter	54 M	Has worked	9 February 2005

<sup>1</sup> The names of the participants given here are fictitious.

Each person's disabilities are summarised below:

NAME	MAIN RELEVANT DISABILITIES
Robert	<ul style="list-style-type: none"> <li>▪ Impaired mobility (requires a wheelchair)</li> <li>▪ Impaired speech (dysarthric)</li> <li>▪ Blurred vision</li> <li>▪ Impaired upper limb function (mainly on left)</li> <li>▪ General impaired cognitive functioning (memory esp)</li> </ul>
Richard	<ul style="list-style-type: none"> <li>▪ Memory problems (new information)</li> <li>▪ Slurred speech</li> </ul>
Trudy	<ul style="list-style-type: none"> <li>▪ Reduced literacy (not acknowledged by client)</li> <li>▪ Can only use one hand (her right)</li> </ul>
Penny	<ul style="list-style-type: none"> <li>▪ Impaired short term memory</li> <li>▪ Reduced skills in organisation and time management</li> </ul>
John	<ul style="list-style-type: none"> <li>▪ Only has use of one hand (left)</li> <li>▪ Impaired short-term memory</li> <li>▪ Speech impaired</li> <li>▪ Limited ability to complete sequences of activities</li> </ul>
Peter	<ul style="list-style-type: none"> <li>▪ Only has use of one hand (right)</li> <li>▪ Vision (reduced visual field)</li> <li>▪ Short-term memory problems</li> <li>▪ Limited ability to complete sequences of activities</li> </ul>

In each case reports were prepared that outlined recommended technology options for these clients. These recommendations are summarised below:

NAME	RECOMMENDATIONS
Robert	<ul style="list-style-type: none"> <li>▪ Height-adjustable table</li> <li>▪ Ergo Q (for use with a laptop computer, as proposed)</li> <li>▪ BigKeys keyboard</li> <li>▪ Ambidextrous mouse</li> <li>▪ Customisation of database</li> </ul>
Richard	<ul style="list-style-type: none"> <li>▪ Trial of Palm device to record reminders and to replace two large diaries that he carries with him everywhere.</li> </ul>
Trudy	<ul style="list-style-type: none"> <li>▪ Compact keyboard</li> <li>▪ Separate numeric pad</li> </ul>

	<ul style="list-style-type: none"> <li>▪ One-handed typing tutorial</li> <li>▪ Customised key pad</li> <li>▪ Word prediction/speech feedback</li> <li>▪ Sticky Keys</li> <li>▪ Special features in Microsoft Word</li> <li>▪ Pocket Coach software with Pocket PC Organiser</li> <li>▪ Literacy software</li> <li>▪ Computer-based training</li> </ul>
Penny	<ul style="list-style-type: none"> <li>▪ Pocket Phone/Organiser</li> <li>▪ Computer-based training</li> </ul>
John	<ul style="list-style-type: none"> <li>▪ Sticky Keys</li> <li>▪ AlphaSmart Portable Notetaker</li> <li>▪ Half Keyboard</li> <li>▪ Phone/organiser</li> <li>▪ Pocket Coach software</li> </ul>
Peter	<ul style="list-style-type: none"> <li>▪ Compact keyboard</li> <li>▪ One-handed typing tutorial</li> <li>▪ Text-to-Speech software</li> <li>▪ Pocket Coach software with Pocket PC Organiser</li> </ul>

As can be seen, recommendations to enhance the productivity of each individual were able to be identified. The extent of benefit possible varied from individual to individual.

Some of the recommendations were of a general nature and would be applicable to any work setting; other recommendations (such as customisation of a database) require an actual job to be identified.

(g) Progress and Outcomes: The next phase of the project was to monitor the progress of each participant in their journey towards employment or in employment. These are summarised below:

NAME	PROGRESS
Robert	<p>Robert faced extraordinary delays in getting workplace modifications in place, particularly a handrail for the toilet. He did not start work until July 2005, even though the job was lined up at the time of our assessment (November 2004).</p> <p>We were able to contribute advice and suggestions to the employer regarding the design of a database that Robert was to use. These included changes to field order, increased prominence for certain headings and buttons, the use of checkboxes rather than drop-down menus, error protection in</p>

	<p>key sections, and congruence between the paper forms and the database. They found this helpful and would not have known where to find such advice otherwise.</p> <p>His employment is continuing successfully.</p>
Richard	<p>Richard needed to trial a Palm device and we arranged this. However the model we had available was an older model, larger than current models. He said it was too large to carry around with him, which meant he had to carry it in his bag. But he was concerned about its fragility in his bag (“my two diaries can take a battering”). This also meant he couldn’t access it quickly. He also found the range of functions available on the Palm confusing, while it was taking him a long time to learn even basic steps like turning the device on or off.</p> <p>As an alternative he purchased a new mobile phone that had better alarm features. This means he can carry the device with him. Such integration works well for him. He is using this successfully and his employer is pleased with this outcome.</p> <p>It was noted that Richard had previously overcome difficulties with driving by using a global positioning system (GPS) in his car.</p>
Trudy	<p>Trudy had already purchased a Compact keyboard. We supplied a one-handed typing tutorial to her job placement agency but apparently she did not use this. Instead the agency relied on the resources of TAFE, where Trudy attended in a special disability class. She graduated from TAFE with a certificate of proficiency.</p> <p>However when an attempt was made to place Trudy in a work trial in a government department, two issues arose:</p> <ol style="list-style-type: none"> <li>1. They were not allowed to use her keyboard without permission from the IT Department. This takes around two weeks – beyond the period of the work trial. The job placement agency staff eventually contravened local policy by plugging in the keyboard anyway.</li> <li>2. Even with the keyboard, Trudy’s keyboard skills were not fast enough to meet the demands of the position. She didn’t have the competence ascribed to her by TAFE, much to the annoyance of the job placement staff. They are now looking for alternative work for Trudy, such as reception.</li> </ol>
Penny	<p>The job placement agency reported that various attempts were made to find positions for Penny, but that she was “very fussy”. In particular they felt she was inflexible about working hours. Eventually she exited the program in August 2005.</p>
John	<p>None of our recommendations for John were able to be implemented, due to lack of funding. Without these in place he undertook a work trial in a photographic firm, doing</p>

	photography touch-ups. This was not successful. He subsequently had to exit the program but is now seeking to re-apply. He is still very keen to work in the IT area.
Peter	Following our assessment of Peter's computer needs there was no way to implement our recommendations. Instead he focused on personal support work as a career direction. After unsuccessful job searches from March to June 2005, he secured a part-time position providing personal support for the elderly in July 2005. He is reported to be very happy in this role.

- (g) Changes Made During Implementation: The original plan, to make a selection of participants from those nominated, did not eventuate. This was because of delays in the job placement agencies nominating participants and to the small number of participants eventually nominated. In essence, we had to go with what we were given.

We were also unprepared for the delays in implementing changes under the Workplace Modifications Scheme. This created delays for the project.

- (h) Evaluation:

- In terms of **processes**, the project went as planned. Job placement agencies were briefed. Six participants were eventually included, as originally envisaged. We underestimated the time taken for nominations to be proposed and for employment processes to take their course. We also did not have the opportunity to select our participants from a larger pool.
- In terms of **impact**, the project had moderate success. We were able to be actively involved in the cases of *Richard* and *Robert* and were able to contribute to an increase in on-the-job effectiveness in both cases. In the cases of *John* and *Peter* our recommendations were unable to be acted upon, due the weaknesses in the Workplace Modifications Scheme (see later discussion). In the case of *Trudy* our involvement was not invited, with the job agency instead relying on TAFE. Productivity-enhancing technologies were not implemented, and the result has been a narrowing in her job opportunities. *Pamela* withdrew from her job program.
- In terms of **outcomes**, the project highlighted a number of deficiencies in the way in which technology benefits are able to be implemented within the current structure of employment support. These are discussed later. These are genuine outcomes, as the purpose of a pilot study like this is, in part, to identify issues.

(i) Effectiveness of Project in Relation to Objectives:

The aim of the project was to test the following two hypotheses:

1. That adapted computer technology can assist people with brain injury to gain employment.
2. That adapted computer technology can assist people with brain injury to retain existing employment.

In terms of these objectives, the project offered some support. *Robert* was assisted to be more productive in his new position, through advice offered for database design. *Richard*, already employed, has been assisted to use generic technology in a more effective way. This has assisted his employment journey without being a decisive factor. But for the other participants, results were inconclusive. The lack of availability of funding for equipment prior to a person's placement in a position meant that our recommendations were unable to be implemented.

Our review of the literature (Appendix A) together with the success of our assessments strongly suggests that adaptive hardware and software is available to increase the productivity of people with traumatic brain injury. While our research falls short of demonstrating this conclusively, it does highlight administrative barriers that largely prevent these benefits from coming to fruition.

(j) Conclusions

This project attempted to ascertain the potential usefulness of adaptive computer technology for people with brain injury in their employment. In so doing it ran into a problem with the main funding system for technology at work for people with a disability – the Workplace Modifications Scheme (WMS). This scheme “reimburses employers for the costs involved in modifying the workplace or purchasing special equipment for new workers with disabilities”.<sup>2</sup> It provides up to \$5,000 for such modifications. Two key aspects of the WMS were highlighted during this project:

1. The WMS is only available when a particular job has been identified. It reimburses an employer for such costs in relation to that worker.

---

<sup>2</sup> Workplace Modifications Scheme (WMS) Guidelines,  
(<http://www.jobable.gov.au/openemploymentproviders/WMS.asp>)

It is not therefore available, even on a loan basis, for people with a disability prior to that point.

2. The WMS rolls together two different types of technology, viz *workplace modifications* (such as toilet modifications or ramps) and *special equipment*, including the computer adaptations featured in this study.

There is no mechanism for funding specialised technology, such as that recommended during assessments undertaken as part of this project, until the person actually has a job. The job placement agencies were therefore unable to act on our recommendations in most cases.

It could be argued that productivity-enhancing computer technology should be available to people with a disability prior to their placement in a job. There are three strong reasons for this:

1. It may encourage people in their job search. Becoming aware of productivity-enhancements through technology may increase the person's motivation to seek work. It may increase their self-belief and confidence.
2. It widens their job choices. Giving them extra skills means that they may have more jobs to choose from. This is a critical issue for people with brain injury.
3. Employers are more likely to take on an employee whose disability has already been ameliorated by assistive technology. It presents such potential employees at their best. A person may have a short-term memory problem, for example, but if they have tools for overcoming the consequences of this at work, then a potential employer is likely to view the person more favourably.

This project also highlighted the paucity of knowledge among job placement agencies regarding assistive technology and its potential benefits for people with brain injury. They seem well insulated from current research in this area. Employers also have little awareness of useful adaptations for employees with brain injury and are largely ignorant of where to find such advice.

(j) Other Publications

As part of this project a literature review was prepared. It covers general issues regarding the application of assistive technology for people with brain injury as well as the use of such technology in the employment setting.

(j) Promotion of Results

Dr Graeme Smith has raised concerns with the Department of Employment and Workplace Relations regarding the operation of the

Workplace Modifications Scheme. This included contributing to a workshop in Melbourne (28/10/05) and also further discussions with Departmental officials in Canberra (8/12/05).

He has also submitted a proposal to present the findings of the research at the Brain Injury Association National Conference in May 2006.

Dr Graeme Smith

7 January 2006