

RESEARCH RELATIONSHIPS RENEWAL

re:connections



Workshop Session 1

New Technologies for Independence

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James Dean
Dr Ashley Craig**

**29 May 2006
Re:connections Forum
Sydney Convention and Exhibition Centre, Darling Harbour, Sydney**

Key points discussed

Dr Graeme Smith, Managing Director, Ability Technology

- The invention of new technologies is the beginning of a process, not the end of a process. Once new technology is developed, it needs to be commercialised and integrated with existing technologies. It also needs to be funded -- society needs to see technology as an investment, not an ongoing cost. Unfortunately, very little research has been conducted in this area to date and very few of these new technologies are available on the market yet (they are still very experimental and few are available commercially).
- Steps for demonstrating efficacy of environmental control systems (ECS):
 - developed with the needs of the severely disabled in mind;
 - trialled on able-bodied systems under laboratory conditions;
 - technological and aesthetic adjustments made;
 - field trials with severely disabled using objective outcome measures;
 - results reported in conferences and refereed journals.

James Dean, Manager, Technical Solutions

Current technologies:

- Assistive technology – item, equipment or product system that is used to increase, maintain or improve functional capabilities of individuals with disabilities.
- Environmental Control Unit/System (ECU or ECS) – a device that an individual may use to overcome their inability to physically access their environment directly; technology designed for the consumer market forms the basis for most ECU devices. These devices communicate via infra-red, X10, radio frequency, C-Bus, or are hard-wired.
- Clients want simple, manual control of facilities; they don't want technology to take over their home. ECU equipment is only of assistance if it can communicate with the facilities that the client wants to access.
- 'Significant technologies' in recent times that have been extensively incorporated into ECU devices include:
 - infra-red remote control systems (ECU systems can piggy-back on most infra-red devices and emulate their signals);
 - hands-free phones or speakerphones (can take phones and provide a remote control for it);
 - home automation products (eg. buy module and plug-in remote control to run home devices such as computers, lights, etc);
 - computers (can be coupled with suitable access system);
 - mobile phones (headset and speakerphone capability, auto answer, voice control).

The future:

- Interoperability: emerging WiFi protocols promise to provide seamless communication between a wide variety of devices; low cost.

- **Wireless Personal Networks:** can incorporate a range of domestic equipment.
- **Bluetooth:** short-wave frequency-hopping radio link between devices.
- **ZigBee:** 'mesh networking' protocol where each node in a network acts as a go-between, passing messages on to other nodes.
- These communication standards will make communication between equipment from different manufacturers possible on a scale not experienced to date. Such networks could also operate public facilities such as lifts and pedestrian crossings.
- However, there are no such devices in ready operation, although they should be available within a few years.

Dr Ashley Craig, Professor, Department of Health Science, University of Technology, Sydney

- **Consequences of SCI:**
 - high dependence on carers;
 - high risk of depression and anxiety;
 - high risk of feeling helpless and hopeless about their future;
 - high risk of pain;
 - risk of social isolation.
- ECS devices have been developed to alleviate some of these problems and to return a level of control to the patient over their environment as soon as possible following their injury.
- **Types of devices for the severely disabled:**
 - suck and puff (binary);
 - mouth sticks and chin operated systems;
 - eye blink systems;
 - touch/pressure systems;
 - voice activated systems (difficulties with change in voice eg. cold).
- **Benefits of using ECS:**
 - patients will learn to cope better with their disability;
 - increases their independence within their environment;
 - decreases the load of the carer;
 - increases the self-esteem of the disabled individual;
 - increases employment capability;
 - allow the severely disabled to stay home for longer;
 - increases recreational capacity.
- **Experimental types of ECS (not yet on the market):**
 - head motion systems with accelerometer: eg. a system that drives a wheel chair using head motion (head forward moves the chair forward, etc);
 - alternative approaches that employ movement of the head and eye as a positioning signal in order to control devices;
 - electromyography or EMG switches: involves a touch switch placed upon the user's cheek that detects changes in surface EMG or muscle activity which then acts as a single switch that allows selection of options from a menu;
 - skin conductance switches are based on the assumption that electrical activity on the skin is less influenced by severe disorder (such as cerebral palsy) than is muscle activity or eye movement;

- brain computer interface (BCI) switches (for people with very limited movement capability), very few available commercially;
- mental motor imagery brain activity (MMI); invasive neural-based electrodes place in animals such as monkeys (show control of a cursor or robotic arm);
- mind switches.