



The Australian Journal of **INDIGENOUS EDUCATION**

This article was originally published in printed form. The journal began in 1973 and was titled *The Aboriginal Child at School*. In 1996 the journal was transformed to an internationally peer-reviewed publication and renamed *The Australian Journal of Indigenous Education*.

In 2022 *The Australian Journal of Indigenous Education* transitioned to fully Open Access and this article is available for use under the license conditions below.



This work is licensed under the Creative Commons Attribution 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

KNOWLEDGE MANAGEMENT

as ENTERPRISE

CAT KUTAY

School of Computer Science and Engineering,
University of New South Wales, Sydney, New South
Wales, 2052, Australia

■ Abstract

Indigenous people have been for a long time deprived of financial benefit from their knowledge. Campaigns around the stolen wages and the "Pay the Rent" campaign highlight this. As does the endemic poverty and economic disenfranchisement experienced by many Indigenous people and communities in Australia. Recent enterprises developed by Indigenous people, such as the sale of art works, can be seen as examples of people receiving remuneration for tangible products deriving from their knowledge. Also, tourism involves the sale of selected knowledge in context. Information and Communication Technology (ICT) is a rich and expanding area of enterprise development which supports the development of knowledge and its use in enterprise. While such work depends on the owner's, or in this case Indigenous, control of the knowledge, it can open up new avenues for enterprise development. Knowledge about local land can be included in children's computer games, knowledge about successful projects can be shared between communities through the immediacy and multimedia format afforded by online environments, and government reports and statistics can be accessed and analysed by Indigenous groups, given tools that suit a community's abilities and needs. In particular the way in which ICT can be adapted to individual requirements make such tools ideal for communities which form such a varied and complex environment. The author believes it is important that Indigenous communities not only benefit from ICT by taking control of the technology for their purposes, but are also part of its creation and design to suit their aspirations. ICT is a highly flexible technology which can be tailored to many different enterprises. This paper presents some of the projects being developed at the University of New South Wales and suggests how these can be extended.

■ Introduction

This paper takes the perspective of a non-Aboriginal person who has been working in technology design and training for technology use in Indigenous communities around Australia and the Pacific for many years. This present work arises from my experience in urban Sydney and the emerging opportunities for Indigenous enterprise within the community in both urban and rural areas. At present Information and Communication Technology (ICT) is used to communicate mostly to the community, or in some cases used by communities to communicate to each other. ICT is technology, therefore cannot be assumed to be without cultural and environmental bias. However, ICT can be readily redesigned to better suit different contexts.

ICT, as used between Aboriginal communities and through the mainstream internet, is not just about communication. What is communicated is information. That information is structured, it is linked to other information, and it includes cultural aspects of the person who conveys the information. ICT can convey valid knowledge if the author's control is maintained and if the audience has the experience to link the component parts of the interchange, or to relate to the interchange with understanding. For instance, if the Cape York Traditional Knowledge Recording Project had been set up as a database for general viewing the result would be that much of the knowledge would be misunderstood and trivialised, as well as the sacred nature of the knowledge itself destroyed. Some of the issues involved in supporting the retention of Indigenous knowledge through databases have been studied by Russell (2005). Furthermore, in support of the process of putting the control of information in the hands of the owners, the type of knowledge that can be handled and the ways in which knowledge can be handled are rapidly changing with new developments in ICT. The interfaces are becoming easier to manipulate. Programming can be done through manipulating pictures and how a programme works can be changed through editing simple text.

There are many areas of Indigenous leadership (Dyson et al., 2007) with a vision of Indigenous development of ICT for enterprises. Not just using ICT for advertising the business, or stock trading, but as a means of controlling the access to, and the sharing of Indigenous knowledges. With some exceptions, Indigenous people in Australia have had their access to new technology and its development limited.

Indigenous people are perpetually being perceived as needing “catch up” training. This thinking clearly needs to change. So what further innovation can Indigenous people bring to ICT?

The internet developed out of a project initiated by the US Defence Department as a network between universities and was extended by the users to provide the present day internet. Now many users of the internet and other software and multimedia tools in Australia are Indigenous people and are interested in taking over control of such resources to support their needs (Dyson et al., 2007). There is more that can be done in this area, and more to encourage Indigenous people to be part of the technological development without removing people from their community or denying their culture. Firstly this paper looks at why many Indigenous people have not entered the field of ICT development in huge numbers, and factors that may assist in turning this around. Then it looks at projects which are underway to change the level of involvement of Indigenous people in ICT. Finally it looks at the way ahead.

Why has ICT not been taken up by many Indigenous communities?

Indigenous communities in Australia have an historical interest in sharing knowledge amongst themselves both as a method of preserving the knowledge and community relationships. This is expressed through activities such as the Garma Festival (Yothu Yindi Foundation, 2006). Communities also selectively publish information on the internet or film for general viewing either through their own organisations or with outside support (Bush Mechanics, 2005; Traditional Knowledge Revival Pathways, 2006). The storytelling skills and the shared wealth of knowledge make this process both culturally and technologically engaging for the Indigenous producers and participants and the practice presents itself as an extension of sophisticated and traditional communication practice. Hence ICT is an ideal technology for use by communities for gaining access to knowledge both from the mainstream community, including through translations, but also through sharing within and between their own communities.

There are many reasons why ICT has not been taken up in broad and systemic ways, the most obvious are:

Lack of background skills

Any area of technological development assumes a familiarity with the preceding technology. There has been a systematic effort to deprive Indigenous Australians with access to communication technologies until the last 20 years with the advent of BRACS radio and the National Indigenous Radio Network. This was an important process that offset the cultural genocide

as practised by many governments and departments. Compare this to the involvement of the Navajo in communications during World War II in the United States, and we can understand why the Navajo had the skills to develop the first community computing network in their lands.

Lack of incentive

This covers many aspects but in particular the incentive to develop skills has not been high as ICT has not been seen of great benefit to the people or community. Continual involvement of communities in projects set up by non-Indigenous personnel often solely for the latter's benefit has discouraged Indigenous Australians from taking part in most technical development. Unless the projects provide support for community the people are not going to be well supported in their struggle to study and gain the necessary expertise to build and maintain their own technology.

Lack of community involvement

This issue is related to the lack of incentives to be involved. New technologies and skills have often been introduced to the community through the children on the assumption they can learn easier or simply because the education system provides a captive audience and access to some resources. This entry pathway could be perceived as undermining the authority of elders. ICT can and must involve both young and old through different aspects of its introduction and development.

Lack of resources

As in many situations involving all peoples suffering historical injustice and exploitation, the lack of finance, compromised family health and varying levels of social dysfunction can mitigate against the attempts by Indigenous people to study in ICT. More immediate concerns can relegate the development of local networks or software tools for knowledge sharing to a minor placing in the setting of priorities.

Lack of control

As a result of all the previous factors, the Indigenous people do not have control over ICT resources they use, often reliant on outside services run by people with a different culture, priority and understanding of knowledge. This increases the hesitation of communities in using many of the existing mainstream services.

The approach taken in the following projects are to provide relevance and community benefits through ICT to provide the incentive for people to become involved. In particular the focus is on software tools that provide an interface which is easily accessible to elders to enhance their control

of the knowledge sharing. There are already people trained within the Aboriginal community, and more will follow. The remaining hurdle is to have those with skills recognised both for the work they do and the work they could do if supported by government programmes or private investment.

■ Adapting ICT

In redesigning a technology to a new situation, such as for use by a different culture, it is always useful to look at examples of the process of adaptation of that technology elsewhere. ICT has been developed as a major area of economic development for Western nations and is now being taken up by other cultures. In the Peruvian highlands wireless short range transmitters provide networked internet access for farmers to access the market price for their wool and potato so the traders cannot under pay (Marroquín & Dueñas, 2005). In the Central Desert artists can now sell online (see Aboriginal Desert Art Gallery, 2005) and ensure the prices of art works are controlled by the market rather than the dealers.

The knowledge gained by people's location provides a unique resource which will be sought by non-Indigenous groups. In the Atacama desert in Chile (MacIntyre et al., 2005), the local people are being paid by science groups to build nets to harvest water from the fog clouds that blow through the area. In the Australian centre, the Feral Camel plan hopes to link camel control with economic opportunities such as live export. It aims to involve people in remote Aboriginal communities in camel management strategies such as educational activities, camel impact surveys and pet meat enterprises (Desert Knowledge Cooperative Research Centre, 2007). The manner in which this involvement is obtained and used is important in such projects. The communication of this knowledge with Indigenous control at least of format and content can be improved by access of remote areas to ICT and data storage systems which are under the ownership and control of the community people.

These are the areas where ICT is clearly an economic tool for communities such as internet banking or internet access generally, but such programmes are not covered in this paper. This paper looks instead at the knowledge management which deals with knowledge as defined by Indigenous people, and as used by the Indigenous communities. However before we leave this area of ICT innovation, it is worth making one point. In Australia, Indigenous people have unique skills in water management, ecological studies, biological data and histories, technological adaptation to severe climate, apprenticeship learning skills, roles in community groups, and mineral history of the land. The presentation, preservation, recognition and quantification of cultural and economic value of that knowledge should be developed rapidly. While there are some measures to

prevent such knowledge being stolen and distributed freely and the source to be acknowledged, nor its context removed, providing greater access to communication technologies would hold the mainstream users of these resources more accountable (Bidwell et al., 2007, p. 13). If those who provide the knowledge, have access to the avenue of sharing the knowledge with the wider community, and control of how it is shared rather than relying on a "broker", there would be more economic benefit to Indigenous people.

■ Open access to external reports on communities

The projects we are involved in deal with Indigenous knowledge management for use by communities. In Indigenous communities in Australia there is an equal need for information that has been gathered from communities to be returned to them, either for verification or for their use. For instance, when the staff of a regional public service office changes their role, they may be asked to do a feasibility study, or analysis, of the current community situation in their area of service. This study may have been done by their predecessor the previous year, but they will be paid to go out and do another one. The information from this study may never be accessible by the broader Indigenous community which is affected by these reports, beyond those consulted, to inspect. Also the previous studies may not be available to use for comparison. The statistics from these studies would provide an invaluable resource for communities to develop programmes and self-analysis.

The aim of one such project is to provide web sites open to community members containing all reports on their community, or including their community (such as the *Royal Commission on Aboriginal Deaths in Custody: National report*, see Johnson, 1995). These sites can be edited by anyone registered with the site if developed as a "wiki". They can be structured so that any report is included with the items of information which are relevant to the community. Tools to statistically analyse reports, can be developed to be used on such databases (Mundine, personal communication, 2005). One valuable site is the HealthInfoNet (2005) which provides both the information and the tools to use this information.

A similar example would be to consider the Australian Language and Culture collection Mura (Australian Institute of Aboriginal and Torres Strait Islander Studies, 2004). Searches can be made of resources by single generic features, but within this feature there are no more detailed searches. That is, the description of the data within each archival resources is very coarse and the tools do not yet exist, such as automatic translating software, to provide a more detailed description of the resources. Also such resources could be linked to language learning resources, to assist language reclamation in the Sydney area (Kirkbright, personal communication, 2005).

Finally another project which the author is working on with Work Ventures and the federal Office of Indigenous Policy Coordination (OIFC) to provide a tool for making community models “come alive”. This is discussed more below, but involves using the outcomes of the present research into modelling the key features of a project. For example we are looking at Community Technology Learning Centre (Van de Peer, 2005). Once the key features involved in successful projects have been established, the relationship between these features, how they influence each other, can be modelled in an interactive visual presentation. Community organisers can then place their community visually within the model and consider what steps they may take to move to a more desirable location in the model. While this does not directly provide an enterprise for the community, it will provide the information to develop and access appropriate funding for the programmes the community considers beneficial, and it will enable them to verify the knowledge that the public service has developed about their community and involve them more in decision-making.

■ Communities sharing knowledge

It is clear that knowledge can be shared within and between communities. To expand this capacity, ICT access for Indigenous people needs to be supported by the full range of infrastructure, hardware and software; the appropriate facilitation of skills, knowledge and tools is also required in order for Indigenous people to be able assess their own needs and pursue their own technology applications and aspirations. Aboriginal people have for years shared their stories and experiences, providing a means of linking knowledge of different aspects of the environment, for instance the deterioration of the rivers around the Cape York peninsular have been recorded and included in the film *The water we know* (TKRP, 2006). ICT provides a way to share these stories, overcoming the significant barriers of travel expense and travel time. However the important need here is the tools to access and make sense of this knowledge. Projects which work in one community could be used by another community, not through government implementation, but through communities sharing either in forums or data repositories, what worked, what did not, and why (Ingram, personal communication, 2005). The process for setting up such a database to enable this sharing is still to be developed. The basic requirements are discussed below:

Suitable structure

The structure of the information, or how it is presented, is important to enable users to understand and learn from it and adapt or edit the knowledge. This may be open structure as in a wiki, or designed specially for

different media to be linked together, not necessarily through text (Digital Songlines, 2006). It needs to have categories according to the needs of the project and relevant to the communities involved. The project would have to be analysed for the underlying structure and this can be used to set up the structure of the information to be displayed.

Information can be added and edited by many participants

An open database structure in the style of a “wiki” site provides different groups attempting the project with access to add their examples and information for comparison.

Multimedia resources can be included

Some of the resources needed to describe a project will be interviews, photos, and copies of documents used. Linking these resources is not achieved by word search, but more through description of the resources, as in XML document format, an extension to HTML.

Privacy

Those outside the project or the communities may not be allowed to access the web site. Therefore the access privileges on the site need to be controlled by the project and community developing the site. The main challenge of this project is to provide a suitable structure for the information about a project. At present this structure is developed through research mostly by people outside communities. For instance in a recent study funded by the OIPC, WorkVentures (Van de Peer, 2005) looked at good practice models for the development of Community Training and Learning Centres (CTLC) in Indigenous communities. The aim of this work was to analyse what type of technology and business models work in a particular situations. However to do this, the researcher needed to analyse what key features distinguish one community or technology application from another. Many Aboriginal organisations were involved in the study and the feedback sessions, however the model is a static set of attributes. There was no ongoing format for the communities to use this model to assist their understanding of the development of their CTLC’s, that is, while we aim to learn what sort of technological or business design we will implement in a given situation, what we need to learn is not so much what is involved in each design, but what distinguishes it from other designs or systems.

As a follow up from the above example, we are setting up a web site to enable people introducing ICT into communities to share information on projects. What worked, what did not and why this occurred. To establish what information to request from each

technology provider to describe their projects and why they chose a specific solution, we need a structured analysis of the technology. First we can list the existing technology types in communities. Then we can consider what features distinguish each technology. For instance, if looking at types of technology for internet access in Aboriginal communities in Australia, we might consider:

- *How long the community had access to communication technology?* This may determine how many people will use the technology, and hence how much bandwidth is required.
- *What previous technology had the community used?* This may determine how readily people will accept the new technology, or if a satellite video link has been in place, this may determine whether satellite link is preferred to a wireless link or phone line to a local town network.
- *What is the expressed need for the internet connection?* This may determine where the computers are placed, what software is installed or what training is organised.
- *What is the common use for internet connection in other communities?* This may determine long-term planning for possible future upgrade.

These are only a few examples, but once the web site is set up to gather information on internet installations, and service providers have described various projects on site, this will become a source of information for both system installers, and manufacturers such as CISCO systems, who wish to understand the market needs.

■ Translation tools

The Australian Institute of Aboriginal and Torres Strait Islander Studies has a large archive of audio and paper based resources on Aboriginal languages. Databases are being developed of language resources including language recordings. Dictionaries are being generated from these resources, as in the Gamilaroi Web Dictionary (Gamilaroi, 2004). Finally languages are being analysed for structure and meaning. All this knowledge can be combined to provide resources for language learning through linguistic software (Kirkbright, personal communication, 2005).

For instance language learning resources based on learning conversational forms can be linked to a translation database. Where words are translated in to one Indigenous language in the resource, usually to provide an example of a greeting or a phrase, this can be translated by software into a different language simply by linking to the database of the relevant language. Web sites have been developed in the local language, however these projects have not always been successful, as Aboriginal languages are not traditionally

a written form of communication. Hence we are looking at ICT which relates more to conversational communication. For instance, internet chat channels that enable speakers in one area to communicate with speakers or learners in another area, either to check word usage, spelling or structure, or to compare different ways of saying phrases.

■ Modelling tools

Another tool is being developed to enable the user to model a renewable energy system. The components can be selected and connected on the screen. Then the system will "run" for a period, giving graphical output of various attributes of the system, such as power available, battery level, etc. This software was developed as an electrical system, can be well modelled, and enables technicians or communities to become familiar with the workings of systems without being able to destroy the equipment. The software includes an editor which formats knowledge according to level of skill. So the user will view a piece of text but the depth of explanation in the text can be adjusted by the user specifying the level at which they wish to learn, such as technology user, maintainer, installer, or designer. The information needs to be developed at each of these levels to be accessed as required, and this has provided a challenge.

Much more work is required on the prototype, however the concept that information in the form of text, component graphics and component attribute values can be used to model a system similar to the one used in a community, and then displayed on the computer, is a useful tool. The text can be added to as people learn about their own system.

Part of the approach of such independent or flexible learning tools is that many Indigenous people may not have access to a long period of technical training and may not wish to leave their community at all. The experiential learning, within a context similar to the environment they will use the technology, is ideal for grasping the specific concepts required for maintenance of technical components, and even to redesign for local use. This approach has been used in the development of the ATWORK program at the Centre for Appropriate Technology in Alice Springs, and is used in online teaching of health care (Foster & Meehan, 2007). Furthermore, the examples shown on the TV show *The bush mechanic* (see Bush Mechanics, 2005) produced by Warlpiri media are certainly not isolated incidences. There are many visual examples in community life of people adapting technology they have become familiar with through use rather than formal training.

Also we should acknowledge that a large amount of research and development funding for renewable energy in Australia has come from remote Indigenous communities who can receive many years' of energy

funding in one payment and hence access these resources. Thus solar and wind energy research and remote lifestyles have complemented each other. The Bushlight renewable energy project has been honoured with an Engineers Australia National Engineering Excellence Award (Bushlight, 2007) for its work in installation and training for appropriately designed renewable energy systems in remote communities. There are other opportunities for symbiotic development of Indigenous communities and unique Australian research.

■ Games for learning

There are two aspects of learning that are interesting in ICT. Firstly, while there are conflicting theories as to the prevalent learning styles within Indigenous communities, the learning needs are generally very different to those in Australian schools or mainstream training contexts. The style of learning of Aboriginal students has been described and debated by many researchers (Nicholls et al., 1996) with at least some consensus that Indigenous students are choosing practical, VET courses over more theoretical components. Stephen Harris (1990) goes further to claim the main differences between Aboriginal and Western belief systems are: religious versus positivist thinking; relatedness versus compartmentalisation; cyclic versus linear concepts of time; being versus doing; closed versus open society; contrasting views of work and economics; contrasting views of authority. While these categories are not embraced by all educationalists in the area, even a sub-part of these differences would affect learning motivation in students, and should affect the design of learning activities. Nicholls, Crowley and Watt (1998) state that the problems associated with programmes designed for Aboriginal education are related to broader historical, social and political issues. The need for "two way learning" between both teacher and student is now recognised in many Aboriginal policies (e.g., Wall, 2006; Department of Aboriginal Affairs, 2003). The processes of learning in context and of personal links with information are important. Brady (2007) found agreement with previous studies by Nichol that the present characteristics of Indigenous learners can be summarised as "holistic, imaginal, (through observation and imitation rather than verbalisation), kinaesthetic, cooperative, contextual and person oriented" (p. 87). Such differences are not necessarily differences unique to Indigenous people in Australia, and supporting an alternative belief system also helps highlight features of the mainstream view to assist those immersed in either culture to learn (or learn about) the other approach.

This provides a new insight into ways of learning which could benefit many children today, both Indigenous and non-Indigenous, who do not always

respond to the mainstream approaches offered: the Socratic method and its emphasis on being wrong; trial and error involving assumptions of cause and effect, or apprenticeship training where knowledge is discussed separately from its practice. These are possibly overused in our present instructional methods. In a study of the use of ICT in learning by Donovan, it was found that there are similarities of the experience of Indigenous people in the use of ICT pedagogies including:

- the ability to contextualise the learning to suit individual or small group needs;
- the use of ICT tools in self directed or peer-directed learning tasks; and
- the ability to develop a space for learning where students can interact and experiment on the learning tasks (Brady, 2007, p. 98).

However, the second and more important issue on learning for this paper is the need for Indigenous involvement in education in the area of ICT and access to computing resources (Radoll, 2006). Without ICT practitioners, both in the area of hardware and software development, the community's abilities to manage their own knowledge through this medium will be compromised. The author is involved in a project to provide gaming and other teaching resources which relate computing skills to the existing interests of Indigenous students. The aim is to support teaching computing in secondary schools in NSW and incorporate an Indigenous perspective (ASISTM, 2006). Indigenous students involved in the programme are showing aptitude and interest in game writing as an extension to their existing game playing skills. While Indigenous students are adept in ICT when they have access at school, this is not yet reflecting in increased retention rates in computing courses, possibly due to the range of socio-political issues mentioned above in relation to general retention rates.

Maori groups use the local knowledge of the elders in a community to provide the environment for a computer game for children to learn this knowledge (Smith & Mann, 2005). It is possible for this knowledge to be included in a game framework through a text editor. That is the community member can incorporate their knowledge into the game without deep programming skills. This is important for the integration of Indigenous people into the ICT literate community at their own pace under some community guidance and control. An example is the Bush Mechanic Flash generated interactive game (e.g., Bush Mechanics, 2005).

■ Tools to enable the process

The most important aspect of the projects developed is to make the technology accessible to all users. The

focus of these projects has been to use and adapt existing software tools which enable information to be handled as text or images and then processed for viewing. For instance, when using an "HTML" editor to write a page for the web, you see the page as pieces of text. In fact there is hidden code that tells your web browser how to format and layout that text. But the general use simply handles the text. It is similar for wiki sites which can be edited on the site. To edit the site you are provided with the text and some formatting instructions and the wiki uses software which formats the site for viewing by the browser.

In all these applications, knowledge can be entered as text and then the software tool models different needs or environments. These tools have been developed to enable less technically adept users of any culture to contribute to the knowledge which is represented in the system, whether a web database on language translation, or a local application for learning about wind power systems. The Aboriginal community has already adapted many such tools to their needs, and others are being developed.

What software is valuable for is the ability to translate the information into a format which is useful for managing knowledge. This may be in exchanging language information or for developing new projects. These tools can be developed for a generic user based on a clearly defined structure of information. It is however a task in extracting the structure of the information, such as for web databases, which will enable the easy sharing and comparing of information, to make it knowledge. At present these tools are being developed as open source software (free to use). The aim is to provide an open site where people can share software tools, ideas for their use and other technology information. The particular use made of these tools is up to the community.

■ Conclusion

The projects discussed here are only part of an increasing network of Indigenous and non-Indigenous Australians who are interested in using the resources of computers and the world wide web for informing people and providing new approaches to knowledge access and control. There are many new techniques being developed for managing the large array of knowledge available and we hope that others will feel the incentive to become involved, whatever the technological hurdles they face in the initial stages. In particular whether technologically skilled or not, all communities can provide knowledge about projects, and the features which enable them to work, or knowledge about their community, to share with others. Also there are always needs in communities to learn and share new knowledge and ICT provides a good forum.

■ References

- Aboriginal Desert Art Gallery. (2005). *Aboriginal Desert art gallery*. Retrieved 2 June, 2007, from <http://www.aboriginal-desert-art.com.au/>.
- Australian Institute of Aboriginal and Torres Strait Islander Studies. (2004). *Indigenous languages and culture resources*. Retrieved 17 February, 2004, from <http://mura.aiatsis.gov.au/>.
- ASISTM. (2006). *ASISTM program: Problem based training and development of educational repository* (Project No. 2060). Retrieved 20 March, 2007, from <http://web.asistm.edu.au/successful2.asp?st=nsw>.
- Bidwell, N., Radoll, P., & Truna. (2007). Forum: Under development. *Interactions*, 14(2), 12-14.
- Brady, F. (2007). Learning to internet bank. In L. E. Dyson, M. Hendriks & S. Grant (Eds.), *Information technology and Indigenous people* (pp. 80-92). Hershey, PA: Information Science Pub.
- Burrarra. (2006). *Burrarra gathering*. Retrieved 10 December, 2006, from <http://burarra.questacon.edu.au/pages/welcome.html>
- Burringurrah. (2006). *Welcome to Burringurrah!* Retrieved 10 December, 2006, from <http://www.sciencelines.org/burringurrah/>.
- Bushlight. (2007). *Bushlight renewable energy project based at the Centre for Appropriate Technology, Alice Springs*. Retrieved 10 April, 2007, from http://www.bushlight.org.au/pdf/Media_Release_BL_Nov_2006.pdf.
- Bush Mechanics. (2005). *Welcome to Bush Mechanics*. Retrieved 10 January, 2005, from <http://www.bushmechanics.com/home.htm>.
- Department of Aboriginal Affairs. (2003). *Two ways together: New South Wales Department of Aboriginal Affairs 10-year plan (2003-2012)*. Sydney, NSW: Department of Aboriginal Affairs.
- Desert Knowledge Cooperative Research Centre. (2007). *National feral camel management plan* [Media release]. Retrieved 10 April, 2007, from <http://www.desertknowledgecsrc.com.au/news/downloads/Feral-Camels-finalRD.pdf>.
- Digital Songlines. (2006). *Digital songlines*. Retrieved 13 July, 2006, from <http://songlines.interactiondesign.com.au/>.
- Donovan, M. (2007). Can information communication technology tools be used to suit Aboriginal learning pedagogies? In L. E. Dyson, M. Hendriks & S. Grant (Eds.), *Information technology and Indigenous people* (pp. 93-101). Hershey, PA: Information Science Pub.
- Dyson, L. E., Hendriks M., & Grant, S. (2007). *Information technology and Indigenous people*. Hershey, PA: Information Science Pub.
- Foster, R., & Meehan, M. (2007). Problem-based online learning and Indigenous tertiary education: Reflections on implementation. In L. E. Dyson, M. Hendriks & S. Grant (Eds.), *Information technology and Indigenous people* (pp. 132-135). Hershey, PA: Information Science Pub.
- Gamilaroi. (2004). *Gamilaroi dictionary*. Retrieved 9 December, 2004, from <http://coombs.anu.edu.au/WWWVLPages/AborigPages/LANG/GAMDICT/GAMDICT.HTM>.
- Harris, S. (1990). *Two-way Aboriginal schooling: Education and cultural survival*. Canberra, ACT: Aboriginal Studies Press.
- HealthInfoNet. (2005). *Australian Indigenous HealthInfoNet*. Retrieved 1 June, 2006, from <http://www.healthinfolnet.ecu.edu.au/>.
- Johnston, E. (1991). *Royal Commission into Aboriginal Deaths in custody: National report*. Canberra, ACT: Australian Government Publishing Service.

- MacIntyre, E., Salvador, M., Cardenas, R., Troncoso, P., & Barros, H. (2005). Coastal fog, satellite imagery and drinking water: Student fieldwork in the Atacama Desert. *Geocarto International*, 20(1), 1-6.
- Marroquín, J., & Dueñas, K. (2005). *Telecenters in Peru: Bridging the digital divide*. Unpublished manuscript.
- Nicholls, C., Crowley V., & Watt R. (1996). Theorising Aboriginal education: Surely it's time to move on? *Education Australia*, 33, 6-9.
- Nicholls, C., Crowley, V., & Watt, R. (1998). Black and white educational theorizing: An evaluation of "Aboriginal learning styles" theory on Australian Aboriginal education. *Ngoonjook: A Journal of Australian Indigenous Issues*, 15, 57-60.
- Radoll, P. (2006). Information communication technology. In B. H. Hunter (Ed.), *Assessing the evidence on Indigenous socioeconomic outcomes: A focus on the 2002 NATSIS* (Research Monograph 26, chap. 16). Canberra, ACT: Centre for Aboriginal Economic, Australian National University.
- Russell, L. (2005). Indigenous knowledge and the archives: Accessing hidden history and understandings. In M. Nakata & M. Langton (Eds.), *Australian Indigenous knowledge and libraries* (pp. 169-180). Kingston, ACT: Australian Academic and Research Libraries, Australian Library and Information Association.
- Smith, L., & Mann, S. (2005, July). *Playing the game: A model for gameness in interactive game based learning*. Paper presented at the National Advisory Committee on Computing Qualifications Conference, Tauranga, New Zealand.
- Traditional Knowledge Revival Pathways (TKRP). (2006). *"The water we know": Project description and summary of film*. Retrieved 10 October, 2006, from <http://www.tkrp.com.au/>.
- Van de Peer, N. (2005). *Good practice feasibility for the implementation of IT access centres for Indigenous communities: Literature review and findings*. Unpublished report presented to the Office of Indigenous Policy Coordination by WorkVentures.
- Wall, D. R. (2006). Two-way learning: Yolngu clan at Australia's Top End shows the way. *KASAMA*, 20(4). Retrieved 20 March, 2007, from <http://cpcabrisbane.org/Kasama>.
- Yothu Yindi Foundation. (2006). *Garma festival*. Retrieved 20 June, 2006, from <http://www.garma.telstra.com/>.

■ About the author

Cat Kutay has recently submitted a PhD in Computer Science. Her work was in supporting learning over the web, in particular group learning and problem-based approaches. Kutay is working at the Sydney Aboriginal Language Centre and with the University of New South Wales Engineering Faculty developing tools for e-learning in the domain of Aboriginal languages and renewable energy systems using a modelling approach to experiential learning. Kutay is interested in the development of tools in consultation with community needs and aspiration and developed with the community and their human resources.