

Identifying Cultural Design Requirements for an Australian Indigenous Website

Reece George, Keith Nesbitt, Patricia Gillard, Michael Donovan

University of Newcastle
University Drive, Callaghan 2308, NSW, Australia

{reece.george, keith.nesbitt, patricia.gillard, michael.donovan}@newcastle.edu.au

Abstract

This paper examines literature concerning the design of culture into websites and in particular indigenous websites. The intention is to identify design requirements as the first phase of building an indigenous website for the Wollotuka Institute located in the Awabakal nation and situated at the University of Newcastle, NSW, Australia. The aim of the project is to produce a website that best reflects the identity, needs and culture of the local Wollotuka community. Wollotuka supports a broad range of indigenous programs incorporating administrative, academic and research activities and provides support and development services for indigenous staff and students. Unfortunately many existing frameworks and indeed Western conceptions about what knowledge is and how it should be captured, organised and presented do not necessarily meet the culture of the intended indigenous users. The work described in this paper focuses on the many issues of concern when attempting to design a website that is specific for a local cultural community such as Wollotuka. We review previous work in cultural design and discuss some generic issues related to the representation and capture of indigenous knowledge. This review provides us with some general considerations and more specific guidelines for culture-specific design. Of particular interest is that narrative and object are conceptualised as a duality in knowledge representations found in Australian Indigenous culture. We also examine issues of design process and use our findings to support the choice of a user-centric design method, where we localise the design, through an iterative, prototyping process.

Keywords: culture specific, web design, indigenous website, focus group.

1 Introduction

The Wollotuka Institute is situated at the University of Newcastle, NSW, Australia and located in the Awabakal nation. Wollotuka was formed to consolidate all the Indigenous activities of the University into one operational and strategic body in order to serve the

University's strategic priority and commitment to Indigenous Collaboration. The four basic functions of the Institute incorporate academic, research, Indigenous student support and the employment and development of Indigenous staff. The staff are comprised of Aboriginal and Torres Strait Islanders.

Wollotuka is housed in a specially designed learning space, the Birabahn building, which was developed to incorporate aspects of Indigenous practices and culture and to present staff, students and community with a warm familiar environment. The design of the Birabahn building incorporates the motifs of the Eaglehawk, which is a primary totem of the Awabakal nation. In a similar way we set out to study the design and development of a web site that incorporated the knowledge motifs or culture of the local community. For, while Wollotuka already provides an existing web site (Wollotuka 2009), it has been designed to fit a more traditional western, corporate framework as used by the University.

Designing culture into a website may seem at first to be a relatively simple task, but it soon raises a number of difficult questions, such as "What is culture?" and "How do you capture culture in a web page?" "More general questions are raised about culture and usability and the globalisation and localisation of user interfaces. Furthermore, some fundamental questions of aesthetics and schemas for knowledge representation also arise. For example, "How should we represent knowledge in an indigenous versus western way?"

With these questions in mind we reviewed existing literature in the area to provide an overall guide to our design work. As is often characteristic of design we identified many guidelines and issues to assist in our work although no prescriptive approaches were identified. To address this problem we also examined processes we could adopt for the project and decided to use an approach founded on user-centric design and iterative prototyping with regular feedback from our target community. However, before we consider the question of "How to capture indigenous culture in a web page?" we return to the fundamental question of "What is culture?"

2 What is Culture?

"Culture" is a complex concept and can mean different things in different contexts and to different people. Indeed Kroeber and Kluckhohn provide 200 different definitions for the concept of culture (1952) and there is a large body of historical work in the area of Cultural

Copyright (c)2010, Australian Computer Society, Inc. This paper appeared at the 11th Australasian User Interface Conference (AUIC 2010), Brisbane, Australia, January 2010. Conferences in Research and Practice in Information Technology, Vol. 106. P. Calder, C. Lutteroth, Eds. Reproduction for academic, not-for profit purposes permitted provided this text is included.

Theory (Cashmore & Rojeck 1999). Culture has also been studied in other diverse fields including, philosophy, economics, sociology, literary criticism, linguistics, psychology and human computer interaction. In a general sense, we understand “culture” to mean the way of life for an entire society or community, the sum total of all the ways of life including arts, beliefs and institutions of a population that are passed down from generation to generation.

It is difficult to analytically describe aspects of individual cultures although the cultural theorist Geert Hofstede did develop a four (later five) dimensional cultural model for classifying different national cultures (Hofstede 2005). Hofstede’s model is typically used in business studies but has also been applied in the domain of human computer interaction. This model is of interest to us because there have been several studies looking at the relationship between his cultural model and the design of user interfaces and websites (Callahan 2005; Marcus & Gould 2000; Robbins & Stylianou 2002; Yuan et al. 2005; Singh 2005).

Hofstede describes culture as the “collective programming of the mind which distinguishes the members of one category of people from another.” (Hofstede 2005, p.51). Culture is described as a collective phenomenon because it is shared with the people who live in the same social context where it is learned. He stresses that culture is learned and not inherited and distinguishes culture from human nature which he considers a universal aspect of mental programming and something that is inherited. He further distinguishes culture from an individual’s personality that he describes as partly learned and partly inherited. A number of different layers of culture are also described, from a national level, to a regional, ethnic, religious or linguistic level and then a gender level. Further levels may be related to the person’s generation, their social class and the work culture of the organisation they work for. These different levels all relate to the different types of social groups that a person may interact with. In Hofstede’s terms cultural differences are seen as manifesting themselves in several different ways, such as the symbols, heroes, rituals and values of the group. In this sense, symbols are words, objects, and gestures that carry a particular meaning that can only be recognised by that culture. Rituals are group activities that serve no purpose and yet are considered socially essential activities within the group. Hofstede describes the core of culture as being composed of values, which are broad preferences or feelings for a particular state of things. For example, values would determine what is evil or good, what is ugly or beautiful and what is normal or abnormal.

As we have already noted there has been some work relating Hofstede’s model to the design of user interfaces and so this is where we begin our examination of culture and design. The four, original dimensions of Hofstede’s model are: power distribution; individual versus collective relationships; masculine versus feminine characteristics and the tendency to avoid uncertainty (Hofstede 2005). Hofstede’s model was based on a survey completed by staff working for subsidiaries of

IBM across 50 different countries between 1967 and 1973. This model was later extended to include a fifth dimension (Hofstede 2005) that distinguished between short-term and long-term orientation. Some examples of national cultures and estimated values for an indigenous Australian group are listed in Table 2.

The power distance index is related to the extent that power is distributed in the culture’s society. Higher values indicate that power is exercised centrally from above, while lower values indicate a more even spread of power through all levels of society. This has been suggested to impact on website design in terms of the level of structure, use of national and authority symbols, the emphasis of leaders versus general community in the web page and the level of security (Marcus & Gould 2000).

The individualism measure relates to the way larger, strong cohesive social groups function as opposed to smaller individual and tight family groupings. We might typically associate Asian cultures with a lower value of individualism compared to western cultures such as America and Australia. This has been suggested to influence how different images are used on a website, individuals versus groups as well as rhetorical styles and the use of young versus older and new versus traditional knowledge (Marcus & Gould 2000).

The masculinity index is intended to estimate the way roles are distributed between genders in the culture. While female values were found not to vary greatly between cultures, male attitudes were found to vary greatly between cultures. They could be very similar to female attitudes where roles were often shared to the other extreme where they were maximally different in terms of assertiveness, modesty and competitiveness. It is suggested that interfaces for higher masculinity cultures should focus on providing efficient results for a limited number of tasks along with an exploratory style of navigation and the use of competition and games. In contrast more feminine cultures would blur gender roles and support mutual cooperation (Marcus & Gould 2000).

The uncertainty avoidance index measures the tolerance for ambiguity and uncertainty and indicates the acceptance or not of less structured or surprising situations. Cultures with higher uncertainty avoidance measures are suggested to prefer simple limited choice interfaces. Navigation schemes should focus on preventing user becoming lost, and redundant cues can be used for reduce ambiguity and user errors. By contrast cultures with a low score on this index may enjoy more uncontrolled navigation in complex web sites focusing on more content and a maximum use of information cues (Marcus & Gould 2000).

The long-term orientation measure was added to the Hofstede model after some criticism that it failed to capture some key differences between some cultures. Values such as thrift and perseverance are associated with a high long-term orientation while respect for tradition and meeting social obligations are relates with lower values. Long-term cultures suggest a preference for content in websites that provide practical value, while

users will have greater patience in achieving their goals. Short-term cultures will seek immediate results from the interface and rely on rules as a source of information and credibility rather than truth being interpreted based on relationships (Marcus & Gould 2000).

Hofstede's model was used in a study of university websites in the Netherlands and Austria. The study found some correlations between feminine values and the masculinity index in the low masculinity country of Netherlands compared to the high masculinity culture in Austria (Dormann & Chisalita 2003). When Indian and American university websites were compared differences in the design were measured in the three dimensions of; uncertainty avoidance, individualism and long-term orientation (Rajkumar 2003 cited in Callahan 2005). A study by Callahan (2005) compared the way web sites were structured as well as the types of graphical elements that were used in university web pages from eight different countries. This study found a general correlation with Hofstede's cultural dimensions.

Cultural Group	PDI - Power Distance Index	IDV Individualism vs Collective	MAS Masculinity vs Feminine	UAI Uncertainty Avoidance Index	LTO Long-term Orientation vs Short-term Orientation*
Australia (western)	36	90	61	51	31
Australian (indigenous)	80	89	22	128	-10
Austria	11	55	79	70	
China	80	20	66	30	118
Finland	33	63	26	59	
India	77	48	56	40	61
Japan	54	46	95	92	80
Netherlands	38	80	14	53	44
South Korea	60	18	39	85	75
United Kingdom	35	89	66	35	25
United States	40	91	62	46	29

Table 1: Table 1: Hofstede dimensions* for a selection of countries (Hofstede 2005)

* Note that this is characterised by a higher value on a scale generally measured by a standard survey instrument to be between 0-100. However lower and higher values are sometimes used when these dimensions are estimated.

If we compare Hofstede's cultural dimensions for Australia as a whole and the indigenous Australian group surveyed in Cape York, Queensland (Simonsen 1999; Hofstede 2005) we note that the indigenous group has a higher centralised power measure, a similar individualism

ranking, a lower measure for the masculinity index and a much higher risk avoidance along with longer term orientation. If we accept the outcomes of Marcus and Gould (2000) this would suggest we design web pages for this indigenous group with some emphasis on leaders, with a simple interface with practical content and good navigation cues. Of course we emphasise that these measures are for a regional group in Queensland and that cultural values for our indigenous target group may well be different. Further work to measure these values is ongoing.

We should note that Hofstede's cultural model is not without criticisms, and some of these include the use of an initial sample made up of employees from a single company and then how well these relate to the national culture as a whole (Sondergaard 1994). There is also the question of whether the survey is even an appropriate method to measure culture and whether the data, much of which is from around 1970 is still relevant to current cultures (Sondergaard 1994). Callahan provides a good review of these issues and the debate in general surrounding Hofstede's model (Callahan 2005). Despite the criticisms, we believe, like many others, that Hofstede's model provides a valuable framework for considering some issues that we need to address in our design. It is certainly not prescriptive and at best can lead to general guidelines to assist in the design process. On the positive side it does also provide a well-known, and structured framework for studying culture.

3 Culturability

We have considered Hofstede's model of culture and its relationship to issues of web design. In this section we discuss more general work related to developing interfaces that are targeted for a specific culture. A summary of these issues is provided in Table 2.

The term "culturability" is used to describe the merging of culture and usability (Barber & Badre 1998). A number of culturability issues have certainly been identified for designers to consider. These include language, social context, time, currency, units of measure, cultural values, body positions, symbols and aesthetics (Fernandez 2000). A study by Ewa Callahan (2005) found that designers use different iconography and also notes the different standards for representing dates, time, and numbers" (257). Similar results from a further study provide a checklist of items to consider, including: "images, symbols, colours, flow, and functionality." (Vatrapu 2002, p.17).

A general issue in cultural sensitive interface design is "understanding representation." (Bourges-Waldegg & Scrivener 1996) These authors argue that factors such as religion, government, language, art, marriage and a sense of humour are universal, it is simply the way they are represented that is specific to each culture. A study that supports this view looks at how different cultural users responded to various visual stimuli in websites (Tsai et al. 2008). The conclusion was that information uncertainty, as characterised by the use of visual elements, does indeed have a direct impact on the user's emotional

response and this was directly related to the user’s culture.

A important relationship has also been identified “between language, cultural context and usability” (Hillier 2003). On the general issue of usability Faiola and Matei contend that different cultures employ different usage strategies (2004). They explore "cultural cognition theory," to look at how web design is impacted by the designers' cognitive style. In an on-line experiment they used websites created by both American and Chinese designers and found that users performed information-seeking tasks faster when they used websites created by designers from their own cultures. Using a well-known cognitive model that distinguishes between holistic and analytical thought (Nisbett et al. 2001) a further cross-cultural study of Chinese, American and Korean users found that the user’s cognitive style was reflected in their perception of the usability of the web site (Dong & Lee 2008).

A recent study even questions if the very notion of usability is constant across cultures (Frandsen-Thorlacius 2009). This work used a sample of 412 users from China and Denmark, and found a basic difference in how the users understood and prioritised different aspects of usability. For example, Chinese users were more concerned with visual appearance, satisfaction, and fun than the Danish users. The Danish users nominated effectiveness, efficiency, and lack of frustration as more important factors in the interface. It has also been pointed out that cultural difficulties in understanding a web site have a natural flow on effect on the learnability of the system (Bourges-Waldegg & Scrivener 1996)

As Nielsen points out: “an interface which is used in another country than the one [for which] it was designed, is a new interface. One cannot trust the original usability work on the user interface to necessarily have produced a design which will be equally usable around the world.” (Nielsen 1990, p.39). Other studies also conclude that usability evaluations need to carefully consider the cultural characteristics of the target group as they may, or may not, impact on the outcomes depending on the group being studied (Herman 1996; Dray 1996)

Much of the research in HCI regarding culture and usability has surrounded the internationalisation-localisation process (Bourges-Waldegg & Scrivener 1996). Internationalisation “seeks to eliminate culture” (Young 2008b) by eliminating cultural symbols, religious references, and so on, while localization caters to the needs of the local target group (2008b p.2) and is intended to incorporate local content and functionality (Shannon 2000) as well as local, context and culture (McLoughlin & Oliver 1999).

Localization of a web site therefore intends to make the site completely appropriate for the user and goes well beyond mere translation (Tixier 2005). When localizing a website interface, possible options include the change of language, time zones, currency, local colour sensitivities, product or service names, gender roles, and geographic examples (Cyr & Trevor-Smith 2004). A user looks for “perfectly clear and understandable information, but he

does not want to be culturally offended by language, images, colors, and so on” (Sandrini 2005). It is therefore the designer’s role to ensure that web sites for international audiences do not contain “symbols that have different meanings in various cultures, variations in language dialect and idiom, starkly different cultural reactions to the same colour, and a host of similar nuances and subtleties that can deeply offend and/or confuse a potential customer or trading partner” (Dysart 2001). For example “in some Asian sites the icon representing home is a pair of shoes, instead of a little house” (Fernandez 2000, p.20). Icons and symbols may also have culturally different meanings. In studies by Brugger (1990), only 13 percent of Japanese recognized a first-aid symbol based on the Red Cross, and most did not associate the symbol letter ‘I’ as referring to information services.

Design Issue
Use of non-local images (scenes, faces, architecture, and customs) can affect learnability (Barber & Badre 1998)
New technical words in other countries have to be created by adapting English words or creating new ones based on native concepts (Callahan 2005)
Design to fit the local writing style. e.g. languages such as Arabic are written right-to-left (Amara & Portaneri 1996)
Translation of the menus, boxes, and icon text can also be problematic because the length of words varies between languages. (Dray, 1996)
Icons based on metaphors such as the mailbox, trashcans may be interpreted differently (Duncker 2002) (Shen et al. 2006)
Care should also be given to the presentation of pictures. Some cultures are very sensitive to how human features are represented (Russo & Boor 1993)
Icons considered international are not necessarily understood globally (Brugger 1990)
Cultures vary in how they present numbers, time, and dates (Callahan 2005; del Galdo 1990)
Specific orientations and page placement vary by culture (Barber & Badre 1998)
Use of colour in web design can impact on the user’s expectations about navigation, content, and links, as well as overall satisfaction (Barber & Badre 1998)
The way holistically versus analytically minded people scan a web page is different. Ordering and arrangement of information needs to be considered (Dong & Lee 2008)
Using icons versus text for navigation can affect error rates and task completion times depending on culture (Choong & Salvendy 1998)

Table 2: Issues of Culturability and Localisation

4 Representing Indigenous Knowledge

The work described previously has identified a number of factors, some general, some more specific that need to be considered in the design of culturally specific websites. These issues range from cognitive style through to the many manifestations of culture such as symbols and rituals and even the choice of colours, fonts and formatting. Now we investigate work that is more specific in the area of indigenous knowledge representation and discuss previous works that concern the design of indigenous websites. A summary of these issues is provided in Table 3.

The idea of a motif or schema for representing knowledge concepts has been well studied in the domains of psychology, education and cognitive science. The term, 'schema' was originally introduced by Bartlett in 1932 to describe a set of abstract mental structures used to represent an individual's understanding of the world (Bartlett 1932). For example, in order to recognize a landscape as a landscape, we must first cognitively create a schema of a landscape as an object that is composed of trees, hills, rocks, ground, sky, and wildlife in a particular order, and then recall the schema when we see it. Schema help people organise their current understanding of the world and help them adapt future knowledge into a framework they already understand. Schemata are not limited to physical objects and include knowledge about different types of people, social roles, sequences of events and processing rules (Nishida et al. 1998). Different schemata may need to be constructed for each individual culture.

Any representation of Aboriginal knowledge needs to address the characteristics, the epistemology and ontology of their culture practices. (Pumpa et al. 2006). This includes performances of traditional practices such as dance and song. This is also found in other indigenous cultures such as the Maori, people of New Zealand whose oral culture transfers knowledge by stories, songs, and art, rather than by written texts (Duncker 2002). Aboriginal modes of communication are "extensions of the oral and face-to-face nature of that society" (Buchtman 1999). Aboriginal stories and songs are "the prerogative of senior men and women (elders) and the rules governing transmission are highly regulated." (Buchtman 1999).

It is also clear that the landscape plays an important role in Australian indigenous stories (Turner 2006). In a study on Aboriginal knowledge systems, Malcolm Pumpa and Theodor G Wyeld (2006) noted: "In Aboriginal knowledge, the landscape is both the visualization of knowledge and the narratives of knowledge. Therefore, any attempt to present the complexity of Aboriginal knowledge and practices in a digital environment needs to provide a visualization of the landscape that is capable of embedding a wide range of knowledge objects."

Indigenous knowledge can also be thought of as reifying culture and identity and existing within "kinship, language and humour." (Pumpa & Wyeld 2006). This contrast with "Western traditions, which emphasize the differences between what exists and how we represent it

in a variety of symbolic systems". Aboriginal knowledge traditions "emphasize the unity of symbol and object—of what exist and how we represent it (Pumpa & Wyeld 2006). Indeed in "Aboriginal knowledge traditions, language, ceremony, singing, dancing and other representational forms can influence events and cause real world events to happen. Objects and phenomena can be 'sung' or 'talked' into and out of existence. These processes of the amalgamation of representation and reality have been going on since the Dreamtime (in Australian Aboriginal terms, the time of creation of things) and continues to this day." (Pumpa & Wyeld 2006).

One significant project in the area of Australian indigenous web design began in 2003 and is called Digital Songlines (DigitalSonglines 2009). This is a detailed project, which examines how Aboriginal knowledge practices have been, until recently, represented in digital media (Pumpa and Wyeld, 2006). The study looks at how to best represent traditional indigenous knowledge using a 3D game engine (Pumpa et al. 2006, 2007). The researchers contend that any digital representation of Aboriginal knowledge must "resolve the conflict between database and narrative views of knowledge", asserting that they need to allow for the "environmentally contextualised narratological nature of Aboriginal knowledge traditions". They contend that the use of a game engine enables a landscape metaphor for hosting Australian Aboriginal knowledge practices based on performance narratives and that formats such as; audio, video and graphics which can be accommodated in this way are better suited for maintaining oral traditions of knowledge exchange (Pumpa et al. 2006)

Typically in a Western database to visualise something, it is first "objectified" and then organized into related categories. However, Aboriginal knowledge objects are non-representational in nature and are embedded in a networked narrative of story, song, dance, art and ceremony. The narrative embeds any knowledge 'object' in a matrix of relationships that is both temporal and spatial. Aboriginal knowledge therefore resists being represented in a conventional rational database schema. The Digital Songline project attempts to solve this problem by immersing participants in a narrative landscape, which has elements of sentience or responsiveness. This is achieved by embedding data objects the data object in "an interconnected network of multi-layered pathways or Songlines" (Pumpa et al. 2006) The authors contend that this catches the Indigenous tradition effectively as the end result "is a vehicle for the unfolding of real-time narratives involving Elders and the ancestral spirits of the landscape." (Pumpa & Wyeld 2006).

The Digital Songlines project also examines the role of the user in any valid representation of Aboriginal knowledge. They believe the user is to be "involved in an extended collaborative, performative narrative which pursues a purposeful journey through a sentient (responsive) landscape, exploring and reaffirming relationships with significant people and the land." (Pumpa & Wyeld 2006). This implies an essential

requirement is for the user to ‘perform knowledge’, that is to actively participate in knowledge construction, rather than merely accessing and manipulating what is provided” (Pumpa & Wyeld 2006).

Most importantly, contemporary Aboriginal knowledge also finds its way into the project. They cite an example: “we have developed some animated sequences from an Aboriginal dreamtime story that is included as part of the world in a transparent manner.” They also stress the involvement of the Indigenous people in the development of the programme. For instance they refer to “the regular consultation with Indigenous artists and representatives from the country” in an attempt to ensure that they are represented correctly. An important observation from the project is that “Aboriginal people in many Australian communities have a real desire to preserve and pass on knowledge practices in spite of the decline in their use of traditional language, loss of ritual and passing away of elders.” This discussion of indigenous involvement in the design process informs our own intended design approach which will occur in close collaboration with our intended community of users.

Design Issue
Aboriginal students prefer simple, “straight to the point” and easy to read English (Gibb 2006)
Familiar images of concrete things that are understood and loved are the key communication device and are a text in themselves. Use of local pictures and images of people are essential (Williams 2002)
Navigation by images is preferred over navigation linked to words (Williams 2002)
There may be use of icons that provide an alternative form of language (Munn 1973)
There is a preference toward real-time communication (Clemens 2002)
Respected teachers or elders are typically used to impart knowledge (Trudgen 1983)
Signing and dancing are often used to teach in the traditional Aboriginal teaching situations (Fischer 1995)
The geographical land is the foundation of Indigenous thinking, They have a strong respect for the land, as well as their culture and language (Auld 2007)
Aboriginal community, family life and children always come before individual pursuits (Gibb 2006)
A sites needs to plan for change and provide the ability for redesign as the needs of the target groups change (Clemens 2002)
Provide multimedia rich environments rather than text based and incorporate a range of audio and visual techniques to encourage usage. (Fischer 1995, Buchtman 1999)
Use of our stories, our songs and our images to pass on the message (Remedio 1996)

Table 3: Design Issues of Indigenous Knowledge

5 The Design Process

Our project focuses on a number of key levels of culture. While we are interested in general issues of representing national indigenous culture in a website, we must also address the issues of both regional and organisational culture in the website. While we have used literature to identify some helpful guidelines for our project there are also many specific, local issues that we expect to impact the success of the project. Considering localization as “a process through which a site is not only translated but also adapted to the cultural, technical, and administrative specificities” (Tixier 2005) we appreciate not only the importance of knowledge representation but also the key role to be played in process when we design our website.

Our intention is to employ a user-centric design process carried out in close collaboration with the Wollotuka community. This will involve an initial focus group followed by prototyping and individual interviews with members of the community. Indeed such a user-centric approach that includes focus groups and interviews, as well as prototypes to gather feedback using structured interviews has been recommended for identifying the “meanings” of a representation within cross-cultural “contexts” (Bourges-Waldegg & Scrivener 1996).

User-centred systems design has been highlighted by many researchers and although user involvement might appear to be “complicated and time-consuming” there are many benefits in involving users during all stages of the design process (Goransson 2003; Goransson et al. 2003). The importance of involving the user community in the planning and design stages of any program for indigenous Australians has been borne out by further studies (Johnston 2001; Dyson 2003; Turner 2006; Fernandez 2000). Furthermore a positive preference for real-time communication, face-to-face contacts and one-to-one or small group meetings has been identified (Clemens 2002).

Studies involving cultural sensitive design also support this approach. For localization requires cultural-unique specifications. However it also impacts on the design process because what may be an acceptable process in one culture may not be an acceptable in another (Young 2008b, p.5). For example, the first step in the design process is to collect data about the intended target audience. In this process “Individual user characteristics and variability of the tasks are the two factors with the largest impact on usability, so they have to be studied carefully” (Nielsen 1993). Therefore each target audience for which the interface is intended needs to take part in this stage of design process (Callahan 2005).

Designing and building the web site in close collaboration with the indigenous community also allows for unforeseen problems that arise to be quickly identified and addressed. We do intend to use the identified issues and guidelines discussed in this paper in a formative way but these guidelines to not offer a prescriptive solution and therefore the final design will rely on user participation and feedback to evaluate our design decisions.

6 Conclusion

We have discussed the notion of culture and how it impacts on knowledge representation. A review of previous work has identified a number of issues involved in the design of an indigenous web site. These include general issues dealing with culturability and localisation of web sites. More specific issues related to the intended indigenous audience at Wollotuka have also been identified. We intend to use these as guidelines to inform our design work in a formative way. However, due to the difficult nature of designing for specific cultures we also intend to adopt a user-centric approach to the design. This will involve close collaboration with the community, involving focus groups to identify initial requirements and iterative prototypes and interviews at regular stages to refine the design.

7 References

- Amara, F & Portaneri, F 1996, 'Arabization of graphical user interfaces', in dG E. & N J. (eds), *International user interfaces*, Wiley, New York, pp. 127-150.
- Auld, G 2007, 'Talking books for children's home use in a minority Indigenous Australian language context', *Australasian Journal of Educational Technology* 2007, vol. 23, no. 1, pp. 48-67.
- Barber, W & Badre, A 1998, 'Culturability: The merging of culture and usability.' *Proceedings of the 4th Conference on Human Factors & the Web*, Basking Ridge, NJ, June 15, 1998.
- Bartlett, FC 1932, *Remembering: An Experimental and Social Study*, Cambridge University Press, Cambridge.
- Bourges-Waldegg, P & Scrivener, SAR 1996, 'Designing Interfaces for Culturally Diverse Users', *Proceedings of the 6th Australian Conference on Computer-Human Interaction (OZCHI '96)*, IEEE Computer Society Press, Sydney, Australia, November 20-24, 2006.
- Brugger, C 1990, 'Advances in the international standardization of public information symbols', *Information Design Journal*, no. 6, pp. 79-88.
- Buchtman, L 1999, *Digital Songlines The Use of Modern Communication Technology by an Aboriginal Community in Remote Australia* University of Canberra Canberra.
- Callahan, E 2005, 'Interface Design and Culture', *Blaise Cronin, Annual Review Of Information Science And Technology*, vol. 39, pp. 257-310.
- Cashmore, C & Rojeck, C (eds) 1999, *The Dictionary of Cultural Theorists*, Arnold, New York.
- Choong, YY & Salvendy, G 1998, 'Design of icons for use by Chinese in mainland China', *Interacting with Computers*, vol. 9, pp. 417-430.
- Clemens, L 2002, 'Billabong: Indigenous Considerations In Website Design', *AusWeb 2002, The Eighth Australian World Wide Web Conference*, Sunshine Coast, Queensland, July 6-10, viewed Monday 2nd February 2009, <<http://ausweb.scu.edu.au/aw02/papers/refereed/clemens/index.html>>.
- Cyr, D & Trever-Smith, H 2004, 'Localization Of Web Design: An Empirical Comparison Of German, Japanese, And U.S. Website Characteristics.' *Journal of the American Society for Information Science and Technology*, vol. 55, no. 13, pp. 1-10.
- del Galdo, E 1990, 'Internationalization and translation. Some guidelines for the design of human-computer interfaces', in J Nielsen (ed.), *Designing user interfaces for international use*, Elsevier, Amsterdam.
- DigitalSonglines 2009, *Australasian CRC for Interaction Design Pty Ltd*, viewed 6th August 2009, <<http://songlines.interactiondesign.com.au/>>.
- Dong, Y & Lee, KP 2008, 'A cross-cultural comparative study of users' perceptions of a webpage: With a focus on the cognitive styles of Chinese, Koreans and Americans', *International Journal of Design*, vol. 2, no. 2, pp. 19-30.
- Dormann, C & Chisalita, C 2002, 'Cultural values in web site design', *The 11th European Conference on Cognitive Ergonomics*, Catania, September 8-11, 2002.
- Dray, S 1996, 'Designing for the rest of the world: A consultant's observations', *Interactions*, vol. 3, pp. 15-18.
- Duncker, E 2002, 'Cross-cultural usability of the library metaphor', *Proceedings of the Second ACM/IEEE-CS Joint Conference on Digital Libraries*, ACM, Portland, Oregon, USA.
- Dysart, J 2001, 'Interactivity: The New Standard For A Web Presence', *ProQuest Science Journals*, vol. Paper, Film and Foil Converter, no. April 2001, p. E1.
- Dyson, LE 2003, 'Indigenous Australians In The Information Age: Exploring Issues Of Neutrality In Information Technology', *New Paradigms in Organizations, Markets and Society: Proceedings of the 11th European Conference on Information Systems (ECIS)*, Naples, Italy.
- Faiola, A & Matei, SA 2005, 'Cultural cognitive style and web design: Beyond a behavioral inquiry into computer-mediated communication', *Journal of Computer-Mediated Communication*, vol. 11, no. 1, p. article 18.
- Fernandez, NC 2000, 'Web Site Localisation and Internationalisation: a Case Study', *City University*.
- Fischer, RA 1995, *Protohistoric roots of the network self: On wired aborigines and the emancipation from alphabetic imperialism*, Zurich.
- Frandsen-Thorlacius, O, Hornbæk, KH, M. & Clemmensen, T 2009, 'Non-universal usability?: a survey of how usability is understood by Chinese and Danish users', *Proceedings of ACM CHI 2009 Conference on Human Factors in Computing Systems*.
- Gibb, H 2006, *The Australian Journal of Indigenous Education*, vol. 35.

- Goransson, B, Gulliksen, J & Boivie, I 2003, 'The Usability Design Process – Integrating User-centered Systems Design in the Software Development Process', *Software Process Improvement and Practice*, vol. 8, pp. 111-131.
- Hillier, M 2003, 'The Role of Cultural Context In Multilingual Website Usability', *Electronic Commerce Research and Applications*, vol. 2, no. 2003, pp. 2-14.
- Hofstede, G 2005, *Cultures and Organizations: Software of the Mind*. 2nd ed., McGraw-Hill, London.
- Johnston, TL 2001, 'Experiences of Female Students Completing A Full-Time Aboriginal Program by Computer-Mediated Communication ', Lakehead University.
- Kroeber, AL & Kluckholm, C 1952, *Culture: A Critical Review of Concepts and Definitions*, Peabody Museum, Cambridge, MA.
- Marcus, A & GouId, EW 2000, 'Cultural dimensions and global Web user-interface design: What? So what? Now what?' *Proceedings of the 6th Conference on Human Factors and the Web. Doing Business on the Web*, Austin, Texas, June 19 2000, <http://www.amanda.com/resources/hfweb2000/hfweb00.marcus.html>>.
- McLoughlin, C & Oliver, R 1999, 'Instructional Design for Cultural Difference: A Case Study of the Indigenous Online Learning in a Tertiary Context', *Australasian Society for Computers in Learning in Tertiary Education Conference*, Queensland University of Technology, Brisbane, Australia, December 8, 1999.
- Munn, N 1973, *Walbiri Iconography: Graphic Representation and Cultural Symbolism in Central Australian Society*, Cornell University Press, Ithaca, London.
- Nielsen, J (ed.) 1990, *Designing User Interfaces For International Use*, Elsevier Science Publishers Ltd.
- Nielsen, J 1993, *Usability Engineering*, Morgan Kaufmann, San Diego, CA.
- Nisbett, RE, Peng, K, Choi, I. & Norenzayan, A 2001, 'Culture and Systems of thought: Holistic versus analytic cognition', *Psychological Review*, vol. 108, no. 2, pp. 291-310.
- Nishida, H, Hammer, MR & Wiseman, RL 1998, 'Cognitive Differences Between Japanese and Americans in their Perception of Difficult Social Situations.' *Journal of Cross-Cultural Psychology*, vol. 29, pp. 499-525.
- Pumpa, M & Wyeld, TG 2006, 'Database and Narratological Representation of Australian Aboriginal Knowledge as Information Visualisation using a Game Engine', *Tenth International Conference on Information Visualization (IV'06)*, IEEE Computer Society, London, United Kingdom, 5-7 July 2006.
- Pumpa, M, Wyeld, TG & Adkins, B 2006, 'Performing Traditional Knowledge Using a Game Engine: Communicating and Sharing Australian Aboriginal Knowledge Practices', *The Sixth International Conference on Advanced Learning Technologies (ICALT'06)*, IEEE Computer Society Press, Kerkrade, The Netherlands.
- Remedio, J 1996, 'Chairperson of the National Indigenous Media Association (quote referenced from Buchtmann. No further information available) '.
- Robbins, SS & Stylianou, AC 2003, 'Global corporate web sites: an empirical investigation of content and design', *Information & Management*, vol. 40, no. 3, pp. 205-212.
- Russo, P & Boor, S 1993, 'How fluent is your interface? Designing for international users', *Proceedings of the INTERACT '93 and CHI '93 conference on Human factors in computing systems*, ACM, Amsterdam, The Netherlands, 1993, <http://doi.acm.org/10.1145/169059.169274>>.
- Sandrini, P 2005, 'Website Localization and Translation', in GB Heidrun Gerzymisch-Arbogast, Gertrud Hofer (ed.), *LSP Translation Scenarios: Selected Contributions to the EU Marie Curie Conference Vienna 2007*, BoD – Books on Demand, 2008, vol. 2.
- Shannon, P 2000, 'Including language in your global strategy for B2B e-commerce', *World Trade*, vol. 13, no. 9, pp. 66-68.
- Shen, S-T, Woolley, M & Prior, S 2006, 'Towards Culture-Centred Design', *Interacting with Computers*, vol. 18, no. 2006, pp. 820–852.
- Simonsen, R 1999, 'Participation by Indigenous Australians in Tourism Ventures: A study of Cultural Differences in Work Related Values, Management Practices and Operational Characteristics in Indigenous Tourism Ventures.' paper presented to Ninth Australian National Tourism and Hospitality Reserach Conference, Canberra, Australia.
- Singh, N & Pereira, A 2005, *The culturally customized Web site: Customizing Web sites for the global marketplace.*, Elsevier Butterworth-Heinemann, Burlington, MA.
- Sondergaard, M 1994, 'Hofstede's consequences: a study of reviews, citations and replications', *Organization Studies*, vol. 15, no. 3, pp. 447-456.
- Tixier, M 2005, 'Globalization and Localization of Contents: Evolution of Major Internet Sites Across Sectors of Industry ', *Thunderbird International Business Review*, vol. 47, no. 1, pp. 15-48.
- Trudgen, RI 1983, *Aboriginal traditional economic system in Central and East Arnhemland*, Northern Regional Council of Congress, Darwin.
- Turner, J 2006, 'Destination Space: Experiential Spatiality and Stories', *Proceedings of the 2006 international Conference on Game Research and Development*, Murdoch University, Perth, Australia, December 4-6, 2006.

- Vatrapu, R 2002, 'Culture and International Usability Testing: The Effects of Culture in Interviews', Virginia Polytechnic Institute and State University.
- Williams, M 2002, 'Reach In - Reach Out Project, Indigenous Education and Training Alliance', ACEC 2002, Australian Computers in Education Conference, Sandy Bay, Tasmania.
- Wollotuka 2008, The Wollotuka Institute, The University of Newcastle, viewed 15 Aug 2009 2009, <<http://www.newcastle.edu.au/institute/wollotuka/>>.
- Young, PA 2008, 'Exploring Culture in the Design of New Technologies of Literacy', in J Coiro, M Knobel, C Lankshear & DJ Leu (eds), Handbook of Research on New Literacies, Lawrence Erlbaum Associates, Inc, Mahwah, NJ, pp. 325-358.
- Young, PA 2008b, 'Integrating Culture in the Design of ICTs', British Journal of Educational Technology, vol. 39, no. 1, pp. 6-17.
- Yuan, X, Liu, H, Xu, S & Wang, Y 2005, 'The impact of different cultures on e-business Web design- Comparison research of Chinese and Americans. ' paper presented to In Proceedings of the 11th International Conference on Human-Computer Interaction [CD-ROM]. Las Vegas.
- Blattner, M.M., Sumikawa, D. et al. (1989) "Earcons and Icons: Their Structure and Common Design Principles." *Human Computer Interaction* 4(1). pp. 11-14.
- Bly, S., (1994), "Multivariate Data Mappings". *Auditory Display: Sonification, Audification and Auditory Interfaces*. G. Kramer, Addison-Wesley Publishing Company. XVIII: 405-416.
- Brooks, F. P., Ouh-Young, J. M. et al. (1990) "Project GROPE- Haptic Displays for Scientific Visualization." *Computer Graphics* 24(4): 177-185.
- Card, S.K. and Mackinlay, J.D. (1997) "The Structure of the Information Visualisation Design Space". *Proceedings of IEEE Symposium on Information Visualization*, Phoenix, Arizona, USA, IEEE Computer Society.
- Card, S. K., J. D. Mackinlay, et al., Eds. (1999) *Information Visualization. Readings in Information Visualization*. San Francisco, California, Morgan Kaufmann Publishers, Inc.
- Cohen, J. (1994), "Monitoring Background Activities". *Auditory Display: Sonification, Audification and Auditory Interfaces*. G. Kramer, Addison-Wesley Publishing Company. XVIII: 499-534.
- Friedes, D. (1974) "Human Information Processing and Sensory Modality: Cross-Modal functions, Information Complexity, Memory and Deficit." *Psychological Bulletin* 81(5): 284-310.
- Gaver, W.W. (1986) "Auditory Icons: using sound in computer Interfaces." *Human Computer Interaction* 2: 167-177.
- Gaver, W. W. (1993). "What in the world do we hear? An ecological approach to auditory source perception." *Ecological Psychology* 5(1): 1-29.
- Gaver, W. W. (1994) "Using and Creating Auditory Icons". *Auditory Display: Sonification, Audification and Auditory Interfaces*. G. Kramer, Addison-Wesley Publishing Company. XVIII: 417-446.
- Goldstein, E. B. (1989). *Sensation and Perception*, Brooks/Cole Publishing Company.
- Granlund, A., D. Lafreniere, et al. (2001). "A pattern-supported approach to the user interface design process". *9th International Conference on Human Computer Interaction*, New Orleans, USA.
- Humphrey, W.S. (2000). "A Discipline for Software Engineering". Boston, Addison Wesley.
- Kramer, G. (1994) *An Introduction to Auditory Display. Auditory Display: Sonification, Audification and Auditory Interfaces*. G. Kramer, Addison-Wesley Publishing Company.
- Nesbitt, K. V., Gallimore, R. et al. (2001) "Using Force Feedback for Multi-sensory Display". *2nd Australasian User Interface Conference AUIC 2001*, Gold Coast, Queensland, Australia, IEEE Computer Society.
- Nesbitt, K. (2003), "Designing Multi-Sensory Displays for Abstract Data". Ph.D. Thesis, Information Technology, Science. Sydney, University of Sydney.
- Sekuler R. and Blake R., (1990), "Perception". McGraw-Hill Publishing Company. New York, USA.
- Soukup, T. (2002) *Visual data mining: techniques and tools for data visualization and mining*. New York, John Wiley & Sons.
- Sowa, John F., ed. (1991) *Principles of Semantic Networks: Explorations in the Representation of Knowledge*, Morgan Kaufmann Publishers, San Mateo, CA, 1991.