Cross-Cultural Usability of the Library Metaphor

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ABSTRACT

Computing metaphors have become an integral part of information systems design, yet they are deeply rooted in cultural practices. This paper presents an investigation of the cross-cultural use and usability of such metaphors by studying the library metaphor of digital libraries in the cultural context of the Maori, the indigenous population of New Zealand. The ethnographic study examines relevant features of the Maori culture, their form of knowledge transfer and their use of physical and digital libraries. On this basis, the paper points out why and when the library metaphor fails Maori and other indigenous users, and indicates how this knowledge can contribute to the improvement of future designs.

Categories and Subject Descriptors

H.3.7 [**Information Systems**]: Digital Libraries - *User Issues.*

General Term: Human Factors.

Keywords: Digital library, cross-cultural usability, computing metaphor, globalization, localization, indigenous culture.

1. INTRODUCTION

In recent years, electronic information and communication technology has penetrated nearly all corners of the globe. The ever-growing Internet has enabled the emergence of new products and services at a global scale that was unheard of twenty years ago. According to NUA Internet surveys, in August 2001 the Internet had 513.41 million users world-wide. 4.15 million users were from Africa, 143.99 million were from Asia and Pacific islands, 154.63 million were from Europe, 4.65 million were from the Middle East, 180.68 million were from the USA and Canada, and 25.33 million users were from Latin America [34]. With this globalization of information cross-cultural issues in global information systems have become increasingly important [7, 17]. E-commerce organizations and local governments are increasingly concerned about the cultural suitability of Web-sites and online services [2].

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Internationalization, globalization, and localization[1] of information systems have become relevant topics with IT and computer science conferences[2].

Most prominently, language- and translation-related issues such as differences in morphology, syntax, and character sets have been the focus of attention for some time. Computer linguistics and machine translation have moved to new heights with the arrival of the Web [3]. Furthermore, variations in format conventions regarding time, date, name, address, and currency, as well as varying legal requirements have been recognized as requiring localization to suit local customs [10]. However, while these aspects of computer mediated global information and communication are fairly well investigated, others are not yet fully understood. Research into deeper cultural issues such as power relationships, group work, or attitudes towards technology has only just begun [25, 30]. Among these less well understood issues are the cross-cultural understanding and use of computing metaphors.

1.1 Computing Metaphors

Metaphors convey meaning in an unknown domain using terms of a familiar domain. Computing metaphors use everyday objects to convey the functionality of virtual objects to the user. While only a certain aspect of the metaphor may be directly visible to the user (e.g. an icon), computer metaphors operate on whole networks of relationships that constitute their metaphorical meaning. The visible part of the email metaphor may be an icon depicting an envelope, but for the user the mail domain with all its relationships comes to life. Nowadays, computing metaphors are an integral part of user interface design, particularly of graphical user interface design. While the use of computing metaphors in user interface design is common practice, this has been controversial for some time. Neale and Carroll [21] argue that computing metaphors are inevitable as overarching design strategies, whereas Norman [23] strongly disapproves of their use. Objections against their use include that they are overly restrictive, that they break down when relationship mismatches occur, and that they are not helpful when they do not

[1] Internationalization is aimed at the avoidance of culturally offending designs. Globalization is the term preferred over internationalization, because cultural boundaries do not necessarily coincide with national boundaries. National states often comprise multiple cultures and ethnicities. Localization pertains to the re-representation of global technology into particular cultures, local markets or "locales"[10] . This includes the use of local (native) languages, and the design for local customs, beliefs, conventions and practices.

[2] For instance the International Workshops on Internationalization of Products and Systems (IWIPS).

correspond to the domain in which they are used. Protagonists counter these arguments by pointing out that computing metaphors do not have to be complete to be understood and that bridging concepts can smoothen the transition and prevent the breakdown of metaphors.

Whether one disapproves of metaphors in the design of user interfaces or not, there is hardly any controversy about the fact that metaphors and metaphorical thinking are deeply rooted in culture [14, 15, 24]. Computer metaphors draw heavily on culturally specific knowledge and practices. This goes for simple visual computing metaphors as well as for composite metaphors on which whole applications or computing environments are based. None of these metaphors translate easily into other cultures. The best known example for a non-translating visual metaphor is the North American country mailbox with a flag set for incoming e-mail. Cultures where the mail is delivered to the door or where mail is being picked up from the post office may need different icons to depict incoming email. The desktop metaphor is an example for a partially translating metaphor. The desktop metaphor itself may translate into quite a number of cultures. Only few cultures, e.g. cultures with an oral tradition, may find the desk top metaphor alien. However, its components, e.g. trashcan, files and folders and their icons do not translate that easily. The icon for folders looks like an American folder, which is a stiff paper folder with a tab for labeling. This folder is horizontally stored in drawers and filing cabinets. European and Japanese documents are stored in cardboard box like containers (called lever arch files). People punch two holes in the paper sheets and put them onto rings attached to the lever arch file. The lever arch files are stored on shelves in an upright position and pulled off the shelf by using a small finger hole in its vertical back side. The vertical side is also used for labeling the lever arch file [18]. More or less elaborated labeling systems are used to ease the process of finding and pulling a document. While American folders have small tabs for labeling and are hidden away in drawers or filing cabinets, European lever arch files have much larger labels which are visible at all times. This changes the search from a recall into a recognition process.

Both examples, the mailbox icon and the desktop/folder icon, are not globally understandable, because the *real world objects* to which these metaphors refer *and their use* are different across cultures. In the case of the mailbox it is the shape, and the way people receive letters that is different across cultures. In the case of the desktop metaphor it is the shape of the object and the filing and search process that is different.

Therefore, the globalization and localization of computer metaphors cannot be achieved simply by redrawing idiomatic, non-translating icons. Cultural differences in the comprehension of metaphors go beyond the shape and color of icons. Deeper and more serious conflicts are rooted in culturally different cognitive, emotional, behavioral, and social processes and structures. This multitude of processes and structures constitutes the network of relationships on which metaphors operate in any given culture. A well-working computing metaphor has to reflect the relationships of the object that is used metaphorically [14]. In other words, the relevant aspects of the metaphor have to be matched with the user's mental model of the related physical object. This mental model has been acquired from experience with the object prior to using the user interface [21]. If we consider that meaning within a given culture is established by ways of societal and cultural use of objects [11], we have to look at the use of real world objects and the cultural context in which they are used to understand cultural differences in the usability of computing metaphors.

On this basis cultural issues of computer metaphors have to be addressed by studying

- the use of the real world objects to which a metaphor refers
- the cultural context of their use
- the use and usability of the computing metaphor

1.2 Methods of Research

Investigating the use of real world objects and their cultural context has been the traditional subject of anthropology and cultural studies. Ethnography is one of the traditional research methods in these disciplines. Originally aimed at recording the customs of exotic cultures, it has been re-interpreted, re-formulated and modernised by several fields. Nowadays, ethnography includes an extended period of participant observation at the chosen site. As the researcher immerses into the world of his subjects he learns the significance of their language and their actions. Sociology and the field of science and technology studies have used this type of ethnography to investigate the production and consumption of scientific results and technical artefacts.

Recently, computer science has recognized ethnographic methods as useful research methods. Particularly the fields of human computer interaction (HCI) and computer supported co-operative work (CSCW) have shown interest in ethnography. In this case study ethnography was the obvious choice because of its inclusion of reflexivity. Cross-cultural studies have to account for cultural biases of the researchers and ethnography enables exactly that [4].

1.3 Library Metaphor and Maori Culture

At first, the cross-cultural usability of the library metaphor seems a straightforward case. Libraries are a widespread phenomenon and therefore suited to metaphorical use. Libraries, i.e. organized repositories of written texts, have already been known to the ancient cultures of Rome, Greece, Egypt, India, and China. More generally, cultures with written languages tend to have repositories of written texts as a form of knowledge transfer [11]. However, cultures that traditionally transfer knowledge in an oral fashion often embed their knowledge in stories, songs, artifacts and rituals. Maori in New Zealand are such a culture. They transfer their knowledge in form of stories, songs, paintings and carvings. They trust certain persons to learn their tribal knowledge and use these tribesmen as living repositories. Although they developed a written language (based on the English alphabet) some hundred years ago, they still rely on oral traditions and face to face communication for decision making. Maori are thus an interesting case with which to examine the use and usability of the library metaphor in digital libraries.

2. MAORI CULTURE AS USER CONTEXT

Maori are a Polynesian culture, which originates from Southeast Asia. They settled in Aotearoa/New Zealand in several waves between 800 and 1300ct [28]. Most Maori tribes trace their ancestral lines back to one of the canoes with which are said to have arrived from the homeland Hawaiki. Traditional Maori cultures vary considerably across Aotearoa/New Zealand, but they have a number of characteristics in common[3]. The main and foremost quality of all

[3] This is comparable to European cultures, which vary, but share certain characteristics.

traditional Maori cultures is their focus towards the tribe and its ancestors. A number of implications follow from this characteristic:

- Maori are oriented towards tribal unity and collectivism, from which they draw strength and support. Tribes, sub-tribes and extended families very much emphasise consensus; things are talked through until agreement is reached. Those who leave the agreed path of consensus, or question it, are threatened with severe punishment. In former times all resources were controlled collectively. Nowadays this applies to tribal properties such as fisheries and land and to mutual support and comfort. Few culturally immersed Maori still live in this tradition.
- The backbone of the tribal world is genealogy. This holds true in a literal sense, as the carved meeting house is named after an important ancestor and its roof top beam represents the spine and side beams represent the ribs of this ancestor. In a figurative sense genealogy orders the Maori world and gives everything and everybody a place.
- By means of this genealogy they also live with and among their ancestors in 'the eternal now'. They are oriented towards the past, which they see as the forward direction and they turn their back to the future [1]. This means that their orientation in time is the complete opposite to ours since we see time progressing towards the future and we look back to the past.
- Another important concept of Maori culture is 'tapu'. The word is usually translated to 'sacred' and sometimes to 'set apart'. The tribal meeting house is sacred, as is the tribal knowledge. People are set apart for being warriors or priests. There are many meanings and attendant conditions of tapu, which are difficult to understand, particularly for non-Maori. For our purpose it may suffice to understand that tapu foremost represents the power of the creator, but other gods endow things and people with tapu as well. Tapu can be good or bad. A whole system of sanctification and nullification keeps the various forms of tapu in balance and life workable [1].
- Representations of people are very tapu, as are tribal genealogy, knowledge and ritual items. It does not matter whether the representations take the form of texts, pictures or carvings. They are only allowed to be used in their sacred, tribal, dignified environment with the attendant rituals in place and are treated with the utmost respect.

While traditional tribal cultures are strongly linked to the tribal land, most contemporary Maori live in the cities and form the majority of the poor population in Aotearoa/New Zealand. Most urban Maori are caught in the circle of poverty, illiteracy, and unemployment with all the attendant phenomena, such as heavy drinking, domestic violence, and crime. Many of them have lost the connection with their tribes and their cultural heritage and have not found much to replace it[4], except perhaps for gang activities[5]. Between culturally immersed and urban Maori one can find Maori who are mixtures of both and who try to juggle traditional Maori values with a Western lifestyle. In this conglomerate of tradition, de-culturization, Western rules and Western economy a new bi-cultural Maori elite has emerged. They are writers, lawyers, teachers, and other professionals. Maori, who go to high-school and university are future professionals of this type. It is in this context that Maori use Western libraries and computers. In other words, Maori users of Western-style libraries and computers are mostly well educated, bi-cultural, (future) middleclass achievers.

Above I have briefly described the general cultural context in which Maori use libraries and computers. In the following sections I am going to describe those cultural issues that are directly relevant for the use of Western style libraries.

2.1 Knowledge transfer

Traditionally Maori knowledge has been transferred orally. For centuries, Maori knowledge and skills have been handed down from one selected person to the next. While no individual knew everything, all knowledge was available within the tribe or sub-tribe at any given time. The keeper of the knowledge was seen as a living repository of this knowledge. He or she was supposed to 'look after the knowledge' which meant to memorize it in great detail, to use it for the best of the tribe and to pass it on to the next person selected to look after it. Genealogies were the core of traditional Maori knowledge. Even today, Maori trace their ancestors back to a particular passenger of one of the canoes with which they came. This knowledge is tapu and not for public display [12].

Over the last hundred years a lot of the traditional tribal knowledge has been lost for good and tribal knowledge transfer has changed a great deal [22]. With not much left to go on, Maori nowadays often consult written and oral records collected by missionaries, ethnographers, interested laymen, and the Maori land courts. Two issues are related to these archives. Firstly, they were not built for the purpose for which they are used today and they are often not correct. For instance, representations of tribal relationships to the Maori land courts were made within tactical considerations aiming at keeping/gaining as much land as possible. They are not necessarily correct. Secondly, most of the content belongs and is sacred to a particular tribe, sub-tribe or family. According to Maori rules, such records should not be publicly accessible and should be kept in sacred tribal or family vaults.

Libraries and museums own quite a number of these historic collections. Some have placed access restrictions on them some have not. Nonetheless, these records are the very items in public libraries that Maori are definitely interested in, mostly for the purpose of reconstructing their genealogies. However, most Maori feel strongly about the fact that these records should not be in a library in the first place. In other words, Maori records in public libraries and other public places create ambiguous feelings. On the one side, Maori are interested in these records and glad they have been preserved, on the other side, the fact that they are in a public library accessible to everybody alienates them.

Due to their respect for tribal knowledge and its sacredness, Maori also have great respect for Western libraries. They often assume that libraries must be very sacred places, which prevents them from entering library buildings and from using libraries. If they ever set foot in a library, they find a number of characteristics of Western libraries that irritate them.

[4] Maori who have been raised with Western European values are often referred to as colonized Maori. I prefer to call them de-culturized because of the grief and bitterness that goes with the loss of cultural roots

[5] The film "Once We Were Warriors" after a book by Alan Duff shows this part of contemporary Maori society. The movie achieved international fame for its unmasked brutality and witchcraft topics.

2.2 Incompatibilities

As much as they are friendly and welcoming with friends and extended family, Maori are extremely shy in unfamiliar situations and with unfamiliar people. They usually show little initiative to venture into unknown territory especially, if they would have to leave their friends and family behind. Schools, universities, and libraries require exactly the above. They focus on individual performance and individual use of resources. Maori students suffer[6] to survive the struggle of studying and living without the comfort and support of their extended family. Maori create a special atmosphere, when they are among themselves; they make each other feel welcome. Libraries and particularly university libraries are functional units, which provide services to readers.

Maori alienation with this strictly functional approach has three aspects. The first aspect is that libraries are used silently, while Maori like communicating to each other:

> "In the library talking is strictly forbidden. We are not used to that. When we are in the library and we find something, excitement may take over and immediately we get hushed, ssssh, quite! Why do we have to be silent? We do not feel home in this atmosphere."

The second aspect is that Maori find Pakeha[7] librarians particularly unhelpful and abrupt. Szekely [31] gives a large number of quotes confirming this problem. The following one is a typical example:

> "When we get to the libraries we want someone to mihi[8] to us. If there was a Maori working in the library, they can tell us exactly where we have to go. Libraries are like Hospitals, very clinical. Staff needs to be more friendly in greeting people"[31].

A Maori librarian explained:

> "They rather learn to use computers, search engines, and online catalogues than interacting with Pakeha librarians".

Indeed, Maori are extremely helpful and supportive towards friends and family. They always go out of their way, to make other people feel welcome. Even a good library service could hardly measure up to these efforts.

However, even if a Maori librarian is available at the counter, as suggested above, Maori library users do not readily ask for help. In the New Zealand collection of Waikato University a Maori librarian used to be available. When observing users in this particular part of the library, I could see Maori students passing the desk at least a couple of times, before they plucked up their courage and asked a question. All Maori interviewees confirmed this behavior. They do not want to be a nuisance. The upshot is, if Maori use libraries, they often do not feel at ease while using them.

Last but not least there are the issues of overdue books and theft. Overdue books are a problem for Maori users, because the Maori concept of borrowing does not go together with strict loan periods of Western style libraries. Most of my Maori interviewees found it difficult to return books in time. Szekely [31] found whole families having a history of not taking books back. He also found theft of particular Maori materials a problem. This type of theft is often motivated by a mixture of preventing sacred Maori knowledge from being exposed to public eyes and getting even with Pakeha institutions as the following quotes indicate:

Maori user:

> "They stole everything, so there is no reason why we cannot steal the Maori books"[31].

Librarian:

> "We used to have a problem with the Maori books at the library, where people used to steal them, until 'Tainui' got to the price, that so many people were stealing them, that Tainui is now at the price of $500-600"[31].

Tainui is the name of one of the legendary canoes. The above book describes the history and the genealogy of the tribes descending from the passengers of the Tainui canoe. Particularly the genealogy in this book is a problem for some Maori. As a matter of fact they do not always steal the book, they often rip out the genealogy pages, which is not necessarily appreciated by other Maori users who would like to use those pages.

Maori user:

> "I said, I'll take you to the library and find that pukapuka[9] 'Tainui'… When we opened that book, the whakapapa[10] at the back was all taken"[31].

2.3 Document organization in libraries

Document organization in Western libraries is governed by the format of the publication (e.g. journals or books) and by the classification system (e.g. Dewey-Decimal). Library users have to understand both to a certain degree to find and access documents.

2.3.1 Western classification systems

The classification of Maori content in a Western library is a major issue for Maori library users. Western library classification systems make Maori content inaccessible. A recent research project on Maori information needs had found that "[English] subject headings were felt to be inappropriate" [31]. Maori knowledge, when divided into subject areas based upon Anglo-American categories, becomes scattered across the library in a seemingly random way. Texts that belong together undergo an artificial division and end up in different places. Subsequently, it is difficult and tiresome to find them and bring them back together again. The following quote exemplifies that:

> "I found that some of the cataloguing as far as themes [were concerned] wasn't very good… I actually think that some of it should be focused in one area. So this is the collection pertaining to so and so, and I know that it doesn't fit Dewey, but he is American. He aha?" [31]

[6] It looks like an exaggeration, but Maori students suffer beyond the comprehension of Westerners, when they are separated from their families and when they have to face university as an individual.

[7] Maori call white New Zealanders of European origin Pakeha.

[8] Mihi = to greet

[9] Pukapuka = book

[10] Whakapapa = family tree, genealogy

The above issue has been discussed in New Zealand's library community for some years [29]. To help this problem a Maori-Subject-Headings-working-party was launched in 1998. They have come up with formats and conventions regarding the production of Maori subject-headings [19]. The Maori subject-headings themselves are yet to be produced, but it is hoped that these subject headings will make libraries more appealing and user-friendly for Maori. However, publication formats were as difficult to understand as subject headings.

2.3.2 Publication formats

On the basis of the above it seems understandable why many Maori do not use libraries. When Maori students come to the university, they reluctantly learn how to use the university library. Subsequently and because they have to, they start using the library regularly. Nine out of thirteen Maori interviewees confirmed this attitude. Most of them had more or less dramatic stories of how they found out how the university library was organized and how they could find books and articles. Here is one of these accounts:

> "I was in this giant law library with thousands of books and case materials. Other students seemed to go in there and miraculously found the right aisle, the right shelf and, aye, the right book. I was baffled. Thousands of books and they had the right one within minutes. […]Yea, somebody had explained to me how to use the catalogue, but I never got the hang of it. I never seemed to find anything in this catalogue."

The lack of understanding of how materials in Western libraries are organized also showed during usability experiments in the computer science department[11]. During these experiments I observed that most Maori participants hesitated, when they had to browse through journals, series, and proceedings. Triggered by this situation I asked more questions about document classification and publication formats. It turned out that six out of eight Maori students had difficulties with five or more of the following concepts: subject headings, serials, proceedings, journals, magazines, volumes, and issues. Pakeha students seemed slightly better prepared. When asked about document organization in libraries, three out of nine Pakeha participants had difficulties with serials, two did not know what proceedings were and one did not know what subject headings were. Considered the early non-use of libraries it does not seem surprising that Maori students lack knowledge about classification systems and publication formats in Western libraries more often and more profoundly than their Pakeha counterparts.

2.3.3 Accessing information

The findings above are supported by earlier research regarding Maori use of public libraries. Szekely reports that "…the way library material was catalogued, classified and arranged was not understood [by Maori users]" [31]. In his 1997 report, the issue of knowing how to access information takes the second place in the list of problems, right after Maori subject headings. Below are some telling quotes from Szekely's report [31].

> "So I was a lecturer there for 5-6 years. I actually paid someone and I got information, I got boxes of it, to access it for me, photocopy it off and put it all in these boxes that are high."

> "The biggest problem that we have is knowing how to access the information… we don't know how to find these books."

However, these problems are not insurmountable as the following quote shows:

> "In my first year another Maori student dragged me into the library and explained to me how it worked. I would never have done that on my own. I would rather have failed my assignments than going into that building with thousands of books and strange Pakeha librarians. As a matter of fact, once he had explained to me how it all worked, it was really easy."

Thus, some Maori finally come to use libraries. Whether they use them successfully or not depends on their understanding of how materials are organized in a library. This understanding apparently depends on whether or not they find somebody – typically another Maori – who 'mihis' them, supports them in overcoming their threshold fear and makes them feel welcome in the library, helps them finding documents, and shows them hands-on how to use the library catalogue.

3. MAORI USE OF DIGITAL LIBRARIES

It is tempting to interpret the lack of library knowledge as something that Maori will (have to) catch up with. However, the matter is more complex than that. The issues raised make Western libraries not only awkward but also counterintuitive to Maori users. Libraries emphasize individualism in contrast to the collectivist Maori culture. Even though Maori knowledge transfer has changed quite a bit, Maori are still very much oriented towards face-to-face communication, which is not allowed in Western libraries. Maori concepts of sacred objects, tribal privacy, and property rights are often not reflected in library policies and do not agree with the built-in openness of the Web. Due to their desire for welcoming and warmth, Maori do not feel welcome in functional Western libraries, even if the librarians are very friendly and helpful by Western standards. Most importantly, English classification systems are inappropriate for Maori content and Maori are largely unaware of Western publication formats.

The above issues are reflected in the way Maori cope with the library metaphor in digital libraries. Although Maori can work with digital libraries, the library metaphor fails in particular areas and makes the use of digital libraries laborious for Maori. This showed in experiments carried out at computer science department of the University of Waikato.

3.1 Experiments

In addition to the ethnography, experiments were carried out. Eight Maori students and nine Pakeha students participated in these experiments. Each participant was asked to carry out a set of tasks with three digital libraries, to think aloud during the experiment, and to complete a usability questionnaire afterwards. The experiments had two purposes; they were designed to complement the ethnography and to study the use and usability of digital libraries for Maori. The experiments were set up such that all variables were kept stable except for the cultural background of the participants. However, real life interfered and changed the set up. The first problem was to find participants of the same age group and the same

[11] These experiments were carried out with eight Maori students and nine Pakeha students. See also next section.

level of computer experience for both cultural backgrounds. Secondly, while all Pakeha students carried out the experiments as instructed and filled in the questionnaires with answers ranging from very good to very bad, Maori students would not 'think aloud' during the experiment and answered all questions in the questionnaire with the most positive answer possible. Thirdly it appeared that quite a number of questionnaire questions did not make sense to the Maori participants, although they had been carefully formulated for this audience [13].

The experimental setback had two consequences. Firstly, the strictly controlled experiments with no interference from the researcher's side were changed into experiments with a collaborative dialogue between the participant and the researcher. This dialogue usually included issues of the user interfaces of the three digital libraries, the actions of the user and their significance for the use of digital libraries. Sometimes the conversation also touched on the user's background knowledge and cultural issues. Similarly to the method of contextual inquiry [27] the intention was to tie the users' backgrounds to their actions while they were using the interface. However, participants also had opportunities to identify usability issues, and to steer the direction of the conversation. Unlike contextual inquiry and more similar to co-operative and participative evaluation methods [26] the conversation was based on experiments in the artificial environment of a usability laboratory.

Secondly, the events leading up to these changes were valuable indicators themselves and were examined in more detail. This lead to some interesting results.

- The differences in age were related to the age differences in the student population. While most Pakeha students came straight from school into university, most Maori students were mature students with an age range from twenty-five to pension age.
- Because of their age, many Maori students could not have come in contact with computers while they were young. Even young Maori came mostly from less privileged, non-academic backgrounds where computers for youngsters were not a top priority, neither in the family nor at school. In contrast to Maori students, the majority of the Pakeha students were younger than twenty-five and had first used computers at school age.
- The single-sided completion of the questionnaire lead to a number of interviews during which I experimented with soliciting positive and negative feedback. As a result I learned that Maori never give direct negative feedback. If one wanted to know anything about problems one had to observe their actions including their non-verbal behaviour and had to "listen to what was not being said".

Consequently, during the experiment-conversations Maori participants primarily emphasized their preferences, while I focused on their actions and their non-verbal behavior. Hesitation, like in the case of browsing through journals and proceedings (mentioned above), usually indicated problems, as did repetition of actions and series of frantic actions. The following transcript was typical for these situations:

> Participant stops working. Silence.
>
> Researcher: "What is the matter?"
>
> Participant: "I don't know."
>
> Researcher: " What are you doing?"
>
> Participant: "I am not sure. Maybe go there?" (Points at the link 'journals and proceedings')
>
> Participant: "Perhaps?" (Looks at researcher)
>
> Researcher: "It depends on what you want to do."
>
> Participant is silent and looks at the screen.
>
> Researcher: "Do you know what journals and proceedings are?"
>
> Participant: "No."
>
> Researcher explains what journals and proceedings are.
>
> Participant carries on.

The paragraph above demonstrates two points. Firstly, it shows that background knowledge of library material organization is important for the understanding of the library metaphor and the use of digital libraries. Secondly it shows the limited usefulness of classic experiments and questionnaires for cross-cultural studies. In a controlled experiment the link between library knowledge and digital library use may not have been made explicit after all. Actually, the link would not have had a chance of showing, unless it had been built into the research hypothesis. This in turn requires knowledge about a possible connection prior to the research project. Although it seems clear in retrospect, this link was not visible beforehand. Therefore this case study may serve as an example of how perfectly designed quantitative methods can overlook the most relevant information.

The experiments consisted of a set of search tasks and a set of browsing tasks. All Maori students completed the *search tasks*, although some usability problems kept hindering them, which lead to prolonged task completion times for Maori. One example of a usability problems was that one of the interfaces confusingly offered two search buttons. Pressing the wrong search button would produce implausible results. Four Maori students pressed the wrong button. Subsequently they neither realized the implausibility of the search results nor detected the mistake of having pressed the wrong button. Most Pakeha students used the right button and subsequently were not confronted with implausible results. Those who did use the wrong button (two) detected the implausibility and abandoned the results.

An example of low usability related to lacking knowledge of document organization in Western libraries was a search engine that offered advanced optional features with a default configuration. This advanced search was similar to online library catalogues. The search engine allowed to search in particular fields such as title, full-text, abstract, reviews and index terms. All Maori students understood the terms 'title' and 'full-text', but the terms 'reviews' and 'index terms' were not known. Subsequently, those who tried to use the advanced options found it quite hard to use these features. If they used them at all they hesitated quite a lot, tried different things, got stuck, and either returned to the basic features or turned to me for help. Most Pakeha students stuck to the basic features. The few who used advanced features seemed to have an idea how to go about it.

Knowledge of document organization in Western libraries was also needed for the *browsing tasks*. It has to be said that most Maori participants were completely unaware of browsing as a possible activity and subsequently of the browsing options provided by the interfaces. This unfamiliarity with browsing was probably due to the

fact that browsing was not a topic in the computer class, while the use of search engines had been taught.

One of the browsing tasks was to find out which type of documents on which subjects were available in the three libraries. Six Maori students tried to solve this question in a first attempt by using the search engines. After a while most of them realized that this would not lead to the required information and they started searching for alternatives. One student kept going with the search engine and finally gave up. The other five tried to find alternatives provided by the interface. Typically they first fell silent and looked at the screen. The researcher then intervened and asked the reason for their silence. This was the situation in which conversations like the one quoted above took place. In the course of the conversation researcher and participant established the lack of library knowledge (What are journals and proceedings?) as a reason for their hesitation. After the participants were given an explanation about journals and proceedings they carried on with their tasks usually by browsing through journals and proceedings.

The examples above show that beneath the seemingly universal and simple library metaphor lurks a network of assumptions related to objects and relationships in physical libraries. In other words, current digital libraries require the knowledge of Western classification systems and publication formats. If the organizational and technical complexity of digital libraries is not well hidden, their use can become a troublesome task even for a seasoned library user. Considering the technical difficulties in digital libraries it may be understandable that developers burden the user with the intricacies of internal document organization. However, from a usability point of view this is not desirable, particularly since it further augments the difficulties of users with little or no experience of Western libraries.

4. CONCLUSIONS

Above I have described the cultural context in which Maori use libraries, computers and digital libraries. Particular attention was drawn to the fact that Maori shy away from Western libraries, because they are counterintuitive for them. The most important cultural clashes were the lack of culturally specific classification systems on the library side and the lack of knowledge of how of materials are organized in Western libraries on the users' side.

Subsequently Maori find digital libraries interesting but difficult to use. These difficulties are caused by a break down of the library metaphor which in turn is caused by a number of cultural misfits. Firstly Maori have traditional tribal knowledge repositories that are emotionally and cognitively different from Western libraries. Secondly, digital libraries use Western classification systems that misrepresent Maori content. Thirdly, Maori have little experience with and therefore little knowledge in Western classification systems and publication formats. These cultural experiences lead to a mental model of libraries that has little resemblance to the conceptual model of digital libraries as it has been developed by (Western) designers. Consequently Maori are (partly) excluded from using digital libraries by the very design of these systems.

The heavy dependency of digital libraries on Western classification systems and publication formats does not only exclude Maori. Other indigenous people and more generally everybody with little knowledge of Western library material organization will find digital libraries difficult to use. The more knowledge of Western classification systems and publication formats is required, the less usable digital libraries will be for these users.

What saved the digital libraries in the experiments was the fact that Maori students employed all their available resources to get through these experiments. One of the important resources of Maori students was their growing bi-culturality. It enables them to move in unknown territory despite their natural shyness. It also enables them to navigate unknown digital libraries with some success. Although it may take them a bit longer, they usually get a result in the end. The other resource Maori students can tap into are their Maori friends and relatives. With the help of a friend or a Maori librarian they learn to use libraries. With the help of a friend they may also learn how to use digital libraries, if necessary.

This does not make the library metaphor culturally relevant or digital libraries efficient for Maori use. As a matter of fact, culturally inappropriate metaphors force the user, i.e. Maori, to do the translation work that is necessary to transcend boundaries between cultures. With culturally relevant metaphors this boundary spanning work would be done by the information system and/or by the system developers and designers of the user interfaces.

Culturally relevant digital libraries for indigenous cultures would have to offer a number of features: Firstly, they need to accommodate locally specific needs for tools such as access restriction tools for Maori content. Secondly, digital libraries need to use local classification systems i.e. culturally specific subject headings. Thirdly, digital library interfaces need to include tools that do not require knowledge of the internal organization of documents. This can be done by providing search and browsing tools that process local natural languages or phrases. An example of such a tool would be the phrase browser of the New Zealand Digital Library, which enables the user to zoom into a selection of documents that contain a particular phrase without requiring any knowledge of how these documents are organized or published. Culturally adaptable intelligent agents might be another venue of improvement in this area.

Digital libraries that have been globalised and localized in the way described above would not only benefit indigenous people, they would support all those users who are not familiar with Western libraries. Potential user groups of this type cannot only be found in countries with indigenous population. Potential user groups would also include ethnic minorities and other less privileged groups of Western-European societies.

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