Designing Digital Knowledge Management Tools with Aboriginal Australians. Performative knowledge making - DRAFT ONLY

Helen Verran, Michael Christie, Bryce Anbins-King, Trevor van Weeren, and Wulumdhuna Yunupingu

Designing Digital Knowledge Management Tools with Aboriginal Australians. Performative knowledge making.

Helen Verran
History and Philosophy of Science,
University of Melbourne, Australia.
hrv@unimelb.edu.au

Bryce Anbins-King
Australian Indigenous Knowledge Systems,
Charles Darwin University, Australia.
Bryce.Anbins-King@cdu.edu.au

Michael Christie,
Education, Charles Darwin University, Australia.
Michael.Christie@cdu.edu.au

Trevor van Weeren,
Merri Creek Productions, Australia.
tvw@bigpond.com

Wulumdhuna Yunupingu
Northern Territory Department of Education, Australia

Abstract: The paper describes digital design grounded in Indigenous collective memory making. We argue that the research should be understood as performative knowledge making and articulate a method appropriate for this mode of knowledge production, and criteria for evaluating its adequacy. The argument is made through juxtaposing descriptions of three heterogeneous elements: the Yolngu Aboriginal Garma ceremony and its uses in secular settings, an actor-network theory (ANT) account of method as an agential assemblage, and an episode in the work of the *Indigenous Knowledge and Resource Management in Northern Australia* (*IKRMNA*) project.

Keywords: Indigenous knowledge management, practice-based research, collaborative software design, actor-network theory, complex 'goods' as research outcomes.

1. Introducing *Indigenous Knowledge and Resource Management in Northern Australia* (*IKRMNA*)

In northern Australia many Aboriginal parents and grandparents are concerned that the younger generation are growing up without a robust Indigenous identity based in a strong grasp of their community's knowledge traditions. They endorse the use of computer databases and other digital technologies to work with audio files, texts, photos, videos, maps, lists etc. to help with their work of teaching. This is how Wulumdhuna the teacher on our research team expresses her worries

> Nhawiku ŋarra ga dhuwal warwuyun ga djamarrkuḻiw' future yalalaŋumirri ŋunh dhu murrmurryunmira ŋaḻapaḻmirrinydja dhawar'yundja ga nhä, nhän walalanydja bulu marŋgithirr djamarrkuḻi yalalaŋuw walalaŋ. ŋayi ga ŋorran ŋula documents walalaŋ balanyaŋurnydja nhäŋur mala, cdŋur or ŋula walal videoŋur walal documents dhu ga ŋorran. Nhäwipuynydja, Bpurru'wuy, nhä ŋayi bäpurru' yolŋu ga yolthu ŋayi malabumar ŋunhi yothuny djamarrkuḻiny', yol nhanŋu ŋaḻapaḻ, ḻiyaw nhanŋu gan ŋäthil nhinan, ga yolku ŋayi mala-bunhawuy. balanya rra ga warwuyundja djamarrkuḻiw' bukmakku djamarrkuḻiw' dhiyal nhakun bala gali'-ḻuŋgurrmaŋur.

> What I'm really worried about is the future of the children. Later the old people will all pass away finish up, and what? What of theirs will the children end up knowing? There are documentation systems for them, something like a CD or maybe those documents will be in video. About what? Ancestral groups, what is his family name, who gave him life, that young child, who are his elders, his knowledge which was there before he was born, and for whom was be born? That's what I'm concerned about, for the children, for all children over here in this part of the world (IKRMNA, 2004).

The specialness of today's generation of Aboriginal elders in northern Australia, many of whom had childhoods only lightly touched by the modernising hand of white colonialism, is widely recognised. One general response to the recognition that their unique knowledge is in many cases dying with them is to launch a digital rescue mission. Notwithstanding this well intentioned project, a significant number of Indigenous and non-Indigenous people respond with horror to the idea of using digital databases to do collective memory in Indigenous communities.

Are digital archiving technologies compatible with Indigenous knowledge? The issue was raised during a rather stormy meeting held at Charles Darwin University in December, 2002. "No, No, Aboriginal Knowledge is out on the land. People live it doing things together on country, and computers actually are more harm than good." The concern grows from worries about disenfranchising Aboriginal knowledge authorities, further marginalising legitimate Aboriginal interests, diversion of energy and resources from Aboriginal priorities, and backgrounding of Aboriginal sensibilities and sensitivities about valid knowledge practices. In short there is a wide spread suspicion that digital technologies can only work by treating IK as a commodity. The anxiety is well grounded, but so too are the worries of those who value the experience of being on country with today's generation of elders and want to keep that experience in a useable form for generations to come. As one young Aboriginal woman put it in replying to the comment above:

> That's all very well, but while our elders are getting very old, the young teenagers today aren't interested in learning anything from them. We need to find good ways of keeping some of the knowledge of the old people of our country before they all pass away.

This paper considers knowledge making in the context of a digital design project grounded in this disagreement. Applying for the grant which funds *IKRMNA* we summarised the project in this way.

> The project responds to increasing demands of Indigenous communities across northern Australia for the use of databases with Indigenous knowledge (IK) to facilitate conservation and intergenerational transmission. The project aims to develop a series of small databases of IK satisfying the requirements of varied stakeholders, including Indigenous communities, resource management agencies and researchers. The project is innovative in giving a dominant voice to Indigenous researchers and consultants in the development of protocols for database structures, protection of intellectual property rights, intergenerational transmission and negotiation of dissemination of information to resource management agencies and academic researchers.

The *IKRMNA* digital design project involves the intersection of two quite different knowledge traditions where almost nothing is held in common between the ways the traditions understand themselves as knowledge traditions. Our response is to problematise the process of knowledge making. We try to find a way of proceeding that connects well enough with both traditions in our particular set of circumstances. Processes are emergent, and accounting them becomes one of the products of the research.

Our practice and its articulation here take inspiration from two sources. We draw on experiences of instruction in knowledge making by Yolngu Aboriginal elders that drove an episode of radical innovation in Yolngu schooling in the 1980s and 1990s. In this paper that experience is juxtaposed with John Law's recent elaboration of method as an agential assemblage (Law, 2004) which can be understood as an extension of actor-network theory. Along with Bruno Latour and Michel Callon, John Law was an initiator of this strand of science and technology studies (Law and Hassard, 1999; Latour, 2005) These two sources of inspiration form a lens through which we 'read' a particular episode of *IKRMNA* research.

In accounting *IKRMNA* practice as performative knowledge making we see ourselves as 'performing' a research product generally useful in contexts where research is practice-

based or practice-led. The product here is method: its exemplification, its elaboration, and its justification.

While the multiple inconsistencies and incoherences of contexts of *IKRMNA* research express contingencies of (among other things) working with dual knowledge traditions, such multiplicity and heterogeneity is characteristic of much contemporary research. Performative knowledge making, now a significant element in the research repertoire of the contemporary academy still struggles for recognition as legitimate academic work[1]. Attending to this shortcoming of 'the official imagination', reflecting back on our practices in *IKRMNA* we elaborate criteria for rigorous evaluation of performative knowledge making.

2. Inspiration from working with Yolngu Aboriginal elders

Here we tell a little of our past experience of working with Yolngu Aboriginal elders and teachers in educational settings in the 1980s and 1990s. There we learned to work with secular Yolngu Aboriginal knowledge practices inspired by and developed from traditional religious knowledge practices.[2] We are *not* claiming that Aboriginal knowledge practices should be understood as a pre-existing form of the processes we elaborate here which we have 'discovered'. Rather we are acknowledging Aboriginal knowledge practices, in so far as they have been revealed to us as powerful sources of inspiration, using them to focus our understandings of recent methodological moves in science and technology studies, and visa-versa.

In the late 1980s in Australia many people in Aboriginal communities were beginning to identify that schools had been used quite openly to capture the minds of Aboriginal children and turn them towards the dominant culture, to assimilate Aborigines into the mainstream society. Around this time a group of individuals associated with Yirrkala School in the Yolngu community grasped control of administration, curriculum and pedagogy in Yirrkala school pushing a government deregulation and devolution policy past the limits the policy planners had imagined. Ten years of bilingual education had prepared the Yolngu teachers for grasping control and for moving the agenda from bilingual education to 'two way' or 'both ways' education although in the beginning no one knew what that might entail. The effect of this move was a school council properly integrated into the traditional Yolngu polity. For a few years this successfully removed the school from direct control of the Northern Territory Minister of Education. As a sub-committee of the 'Nambara School Council' an Action Group directed all the affairs of the school.

The Action Group was constituted by all Aboriginal members of the school staff. This included administrative, clerical, and ancillary staff, language workers, and assistant teachers. Involved as non-Aboriginal participants in this collective action we were under the direction of and directly accountable to the Action Group. From the early 1990s the work of the Action Group began influencing the functioning of Yirrkala School in profound ways. Researching and developing a radically new mathematics curriculum was just one area of innovation that emerged under this form of school governance (Yunupingu   ; Marika-Munungirritj   ; Ngurruwuthun   ). Informed by action research the social relations of the research problematised teaching and learning. This required public negotiation and re-negotiation of places to start and directions to proceed involving all those involved in the research. Within this frame all levels and types of performance in the school were problematised.

Remembering our experience of this school based research of the 1990s we saw that IKRMNA research and its tangible products, designs of digital databases that manage digital objects in secular Aboriginal settings, should be understood as collective performance. Similarly, accounting and justifying them must also be performance. We recognise that any representations of *IKRMNA* we generate (like this paper) should be understood as realised in particular sorts of performance. In this case, writing for an academic journal has a written text re-presenting embodied performance.

The Yolngu metaphor of Garma was crucial in the work of the Action Group. The Garma or non-secret, 'opening-up' ceremony ground is a publicly recognised site for the negotiated performance of ceremonies. Bringing their specific and particular clan knowledge, Yolngu from diverse land/language combinations, come together and celebrate their samenesses and differences through collaborative performance. Within the Garma, individuals work as groups (dancing, singing, painting, talking), to produce a new definition of the here and now, bringing the past into the future through collaborative representations of Ancestral practices and events. They work to produce a shared knowledge while preserving (and emphasising) their particular land/history based individualities.

This is how Raymattja Marika-Mungirritj first explained the processes of convening a Garma to some of us when we were beginning to research what became Garma Maths at Yirrkala School (Yirrkala School, 1996).

> Yolngu ideas have always 'gone around' in making collective decisions in a forum, in a special area called "Garma". The Yolngu word for this network of discussion is "djarrma", a metaphor taken from the native rat who runs back and forth through all the tunnels under the ground, busily taking news and opinions from person to person, group to group. The first step, "djarrma" is like a critique, people expressing ideas, discussing with each other, and from out of that group, someone is delegated to go to the next level. This is where 'the story' from the smaller group is taken by those two or three people, or maybe one, to the larger group. That person is called the "bo'puyngu". This means like a messenger or a delegate. The people have talked or expressed their idea earlier, in a smaller group, but that group is really only part of a larger group. So it is the larger group that makes analysis of the situation, settles disputes, and gives direction to the people. ….The "bo'puyngu" would tell them the details of what sort of ceremony was planned, where it was to be and when. That's how to negotiate with people, as a group, going to a larger group. Everyone has a part to play in the ceremony, the large public forum. So this is how the ceremony is negotiated. There is a special word for the way ceremonies and other important events are planned, negotiated, executed and evaluated. The word is "gurilkuma"… It is always considered to be a very bad thing in Yolngu society for a ceremony, or any project, if everyone isn't in agreement first on how we start.

The Garma is a site and a resource where new knowledge is produced for the local context from co-ordinated re-presentations, largely sourced from outside, that is from the various estates and histories of the contributors. After agreement has been reached and the ceremony can begin, the best performers have the ability to access, and interpret a full range of grounding concepts in each new context of meaning making. The skill of the performer as singer, painter, or dancer lies in both the originality and the acceptability of innovations presented.

The connectedness of Yolngu knowledge needs to be enabled, foregrounded and enhanced by the performance of the Garma if it is to serve the community which owns it. Discussions as to which connections are productive and which are to be obscured need to be made before the ceremony comes to life. The Garma itself needs to be read discursively alongside the elements it presents and works: Who does the Garma belong to? Where do the performers belong? How do we read their performances? Whose interests do they serve? Which structures or concepts does the Garma embrace and which does it marginalise? What possibilities for knowledge making does the Garma support and prevent? Reading the Garma keeps track of who benefits and how from the 'goods' generated in the work of the Garma.

Social-material-discursive designing makes a ceremony as collaborative, negotiated in the context of the community of practice which the ceremony transforms, and which is itself continually transformed through acquisition of new ideas, members, activities, and technologies. The complex assemblage that is a Garma has a form of agency that is collective, distributed, and composite. It involves a moment of collecting together many specific elements, and a subsequent moment of eversion when the new grounds

articulated in the Garma are expressed in performance. In Yolngu theory the boundary between these moments is called galtha.

3. Performative knowledge making

We have told the Garma episode we participated in Yirrkala in the 1980s and 1990s as performative knowledge making. Here we suggest that performative knowledge making is becoming increasingly mainstream in the Australian academy, particularly in digital design. The role of this section is to suggest that what we're doing in IKRMNA has wider significance than dealing with Aboriginal Australian Indigenous knowledges. The claim is that the method we have worked out on the basis of our experiences with knowledge making in Aboriginal Australia and our reading of ANT is of significance for researchers in design generally, particularly digital design.

This section lays out what (in Western knowledge making traditions) needs to be considered when we think about method and its validation/legitimation. We see the work of understanding knowledge and necessarily its evidential practices as a historically and contingently constituted natural phenomenon conducted by reflective human beings, understood in terms of the life context in which these activities are rooted and sustained. This move refuses conventional assumptions about representation and reality that underlie philosophy's claim for epistemology as *a priori* (Maffi, 2005). Extending that we see epistemologies as emerging from collective action expressing the complex scenarios in which the research proceeds. In other words, we see epistemology as emergent, as an outcome of the workings of both the Garma and agential methods assemblages.

Developing this, our paper draws on Lucy Suchman's work informed as it is by feminist studies of science and technology. Asking the seemingly odd question 'Where is design?' Suchman suggests that locating design is the first step in replacing design as "ways of being nowhere while claiming to see comprehensively [with] views from somewhere" (Haraway, 1991: 193 and 196). This is exactly the move in performative knowledge making.

Recent articulations of 'practice-based research' in various academic contexts is one expression of the increasing significance of performative knowledge making in the academy. Globalising and an associated paradigm change in Australia's research funding environment wrought by Federal Government policy preferentially funding research of direct economic benefit to firms, NGOs and/or particular government enterprises is driving this change.

In Australia research which focuses on transformation and transaction has shed its former second class status as 'applied research.' Instead research which generates products in creative and collective devising of innovative transformations is privileged. There has been a rather rapid unravelling of a division of labour previously enshrined in the academy which separated pure from applied research and incidentally also "separated the good of truth from other goods such as politics, aesthetics, justice, romance, the spiritual, the inspirational and the personal." (Law, 2004: 15) It seems that the crumbling of the territorial nation state where a positive, encyclopaedic knowledge economy held sway is driving these changes (Bauman, 2002:232).

IKRMNA is no exception. Funded under the Australian Research Council Linkage Grant scheme, it brings together multiple and complex stakeholders and partners and is answerable to their disparate and sometimes opposed interests. Along with the partner organisations the project is directly accountable to the various individuals and groups of Aboriginal people with whom we are involved in our on-the-ground work. These people involved in their own 'business' are using digital technologies to further their own interests, sometimes opposed to one or more of our official 'partners.'

Despite becoming increasingly significant, research involving performative knowledge making is beset with anxieties. Anxiety is evident firstly in questions around how performative knowledge claims might be justified. Where and what are its evidential

practices? These are problems of epistemology relating to theories of what knowledge is. In *IKRMNA* this is profoundly problematic for we work within knowledge traditions with incommensurable epistemologies. Our claim is that accounting performative knowledge making involves reconstruing epistemology. In this we find actor-network theory (ANT) and its various 'after-ANT' developments helpful (Law, 2006).

The second locus of anxiety in performance based knowledge making involves questions around 'goods', interests and distribution. Much contemporary research involves congress between the academy, commercial R&D and industry, intellectual property is an integral part of what is at stake. These are moral questions over right ways to proceed. Our view is that explicit attention to these issues is essential in the valid performance of knowledge making.

Dealing with these anxieties around performance based knowledge making involves social and institutional change, both in the personal and public spheres. Art and design researchers need to acknowledge their neuroses about being 'outsiders'; funding bodies need to reconsider their 'missions' with the demise of the encyclopaedic knowledge economy; institutions need to reassess what 'disciplines' achieve, and reconsider the need for the obsessive 'boundary work' of inclusion and exclusion necessary to maintain a discipline (Prophet, 2004).

Performative knowledge making can be rendered in orthodox foundationist terms, for example it can be presented either as 'content-led' or 'technology-driven' research (Thomas, 2004: 1). But this move which many of those practicing performative knowledge making are forced to make in applying for funding is costly. It leaves practitioners who work the borderlands between community, business, and the academy unable to adequately evidence their knowledge claims and with no way to deal with the moral issues associated with questions of who benefits and how.

Western or objectivist epistemology is blind to what is at issue in performative knowledge making. One response to this failure is to acknowledge the issues as epistemological but only covertly deal with it. Kaipainen for example correctly refuses to identify sites of performative knowledge making as 'a conservatory', which laboratory-like we might imagine as part of an encyclopaedic knowledge economy. He insists instead on their being recognised as 'kitchen' or a 'crucible' where transformations are wrought. (Kaipainen, 2004: 8) Actually this mixes two proverbs useful in understanding the evidential practices of performative knowledge making: 'proof of the pudding is in the eating' and 'gold is proved in the fire.'

Our response to recognising that performative knowledge making somehow evades the gaze of conventional epistemology is first to ask where this happens. The blindness seems in part to arise because the research analytic of performative knowledge making often does not involve causal reasoning involving discrete entities. Instead it has a tendency towards relational and process thinking and is inclined to exploit analogy and comparison. It can be seen in this paper where we juxtapose as analogies: an account of the Yolngu Aboriginal Garma ceremony, an exposition of 'agential methods assemblages' as developed in science and technology studies, and an episode of *IKRMNA* research. Research in a positive knowledge economy is inevitably backward looking involving process and product dualism. There is no such distinction in performative knowledge making where the product is the process and visa-versa. The galtha of Yolngu knowledge making recognises (and theorises) exactly this.

Performative evidential practices evade, are not recognisable within the fames of Western objectivist epistemology. Or we could put things the other way around and say the framings inherent in performative knowledge making are not recognisable within the evidential practices of conventional epistemology.

So we are led to ask about the evidential practices of conventional epistemology. Recognising the inhibiting effect that conceiving epistemology as an autonomous *a priori* enterprise prior to and normative for all other inquiry has had on modern research, we approach these questions from the position that dogmatic rule of a single

epistemic culture valuing facts and their representation has left us unable to collectively and rigorously prove design and artful creation in performative terms. Crucial in tackling questions around validity and proof are recent moves to re-construe epistemology as simultaneously metaphysical and empirical (Law, 2004: 38).

In performative knowledge making intellectual property rather than seemingly neutral facts is usually the research outcome. While the truth of facts seems self-evidently a public good and properly produced by the academy, that is not so easily assumed about intellectual property. In performative knowledge making interests are multiple and disparate and variously invested. An important element of the work leading up to the Garma and in the working of the Garma itself is (re)distributing the intellectual property emergent in the ceremony between the participating clan-based knowledge complexes.

Uncomfortable questions of 'Who benefits and how?' arise right from the beginning and continue as emergent in the collective action. Such issues need to be made explicit and publicly attended to. And here we see the folly of following convention and trying to separate out truth out from the other 'goods' that arise in performative knowledge making. Questions of epistemology are just one element in 'right way finding' in the collective action of performative knowledge making.

Taking epistemology and right ways of dealing with interests and distributions as emergent in the collective action imposes requirements. To be judged as adequate an episode of performative knowledge making must, as part of the work, explicitly identify and justify its evidential practices and articulate arguments about accountabilities. But where and how is this done? We find it in right workings of social institutions, in particular material arrangements, but perhaps most significant of all in narrative. Contestations around stories by which we tell ourselves and others about who we are and what we are doing here, are perhaps the most significant of the places where evidential and moral practices are played out.

4. Agential methods assemblages

In section 2 we laid out the metaphor of Garma as a ceremony ground where disparate knowledge resources are deployed in tension to generate an opening-up. In this multi-faceted tension working concepts must take 'the other' into account, and the process re-grounds collective life in particular ways. We turn now to science studies, a strand in the Western academy to develop a second metaphor: 'assemblage'. The term arises in the English translation of the French text of Deleuze and Guattari *Mille Plateaux*. An assemblage

> is like an episteme with technologies added but that connotes the ad hoc contingency of a collage in its capacity to embrace a wide variety of incompatible components. It also has the virtue of connoting active and evolving practices rather than passive and static structure (Watson-Verran and Turnbull, 1995, 117)

Insisting on assemblages as uncertain and unfolding rather than as fixed arrangements, Law quite properly takes us back to the French in introducing the term

> In Deleuze and Guattari the English term 'assemblage' has been used to translate the French 'agencement.' Like 'assemblage', 'agencement' is an abstract noun. It is the action (or the result of the action) of the verb 'agencer'. In French 'agencer' has a wide range of meanings...'to arrange, to dispose, to fit up, to combine, to order'...the term has no single equivalent in English. [W]hile 'assemblage' is not exactly a mistranslation of 'agencement' much has got lost along the way. [T]he term has come to sound more definite, clear, fixed, planned and rationally centred than in French. (Law, 2004: 41).

Taking this issue seriously we add agential as a front end, thereby adding redundancy and unsettling the stolidness of the English, better catching sense of 'agencement'. The sense of agency we are calling up is one where

> [a]ction is not done under the full control of consciousness; action should rather be felt as a node, a knot, and a conglomerate of many surprising sets of agencies that have to be slowly disentangled. It is this venerable source of uncertainty that we wish to render vivid again in the odd expression of actor-network (Latour, 2005: 44)

So where do 'methods' come in? To explain this we turn to a recent article where the North American power grid is exemplified as an agential assemblage and its agency explored (Bennett, 2005; 445-65). The episode that allows this exploration is the black-out that struck much or North America in August 2003. The power grid has been collectively designed to distribute electricity, and recently to support a long-distance electric power market. The effect of the blackout was to demonstrate very clearly that the grid has agency that quite eludes control by engineers, who are quite unable to explain, or even fully describe how it works, and how it fails to work.

> ...the biggest gizmo ever built...On Thursday [August 14, 2003], the grid's heart fluttered... Complicated beyond full understanding even by experts [the grid] lives and occasionally dies by its own mysterious rules (Glanz, 2003, quoted in Bennett, 2005; 446)

'The grid' as an assemblage is a gizmo designed to distribute electric power, but its agency is not fully describable or understandable in the terms of that design. Similarly 'method' as an assemblage is 'a gizmo' designed to produce valid and right collective knowing, and its agency is not fully describable or understandable in terms of design. Understanding a Garma ceremony as such a gizmo, an agential methods assemblage we see clearly that it has agency that eludes full understanding when people begin negotiations. In the beginning no one has a clear idea of how things will actually turn out.

The agency of a method assemblage is to foreground some relations or connections, to push others to the background, and to render others quite outside 'the frame'. Law sees a method assemblage as generating presences and absences and as 'Othering' (Law 2004:42). In this way they generate realities and our knowing them simultaneously. He argues that this has in the past been understood in far too singular a manner. We said that another way in the previous section in pointing out that the former division of labour that held in the academy was underwritten by an agreement to take epistemology as an *a priori* enterprise, normative for all knowledge making. Law exhorts us to cultivate possibilities for inventing methods assemblages that are transformative in more gentle and humble ways that recognise the existence of multiple, vague realities (Law, 2004: 14).

Cultivating those possibilities is not only devising ways for generating specific presencings/absencings/Otherings but also for justifying. Working agential methods assemblages involves arguing over why this is necessary here, and why that is redundant or interferes, all the while explicitly identifying the basis of the choice— aesthetic, validity, technical. We need to become comfortable with being open about arguments based on politics and aesthetics to name just two 'goods' that often figure along with truth in the products of performative knowledge making.

So now we use the metaphor of the Garma with its justified moments of gathering and opening up pivoting around a galtha, and the notion of an agential methods assemblage with its justified transformative presencing/absencing/Othering, to bring our *IKRMNA* research into focus as performative knowledge making. But first we need to show ourselves doing that work. Not an easy task in the confines of an academic paper[3].

In contriving to show the transformative presencing/absencing/and Othering of *IKRMNA* work, its gathering moments and it eversion through the galtha, we present three working texts. Our exhibit here has limited aims, in our curating we have tried to foreground the galtha and show particular presencing/absencing/Othering and possibilities for justification. We use a particular design product that has emerged from

our work, *TAMI*, locating it with respect to just one of the contexts that contributed to its birth: Wulumdhuna's work with the children and elders of her community.

5. *IKRMNA* research

After our research had been going for a little over a year, at a public meeting to launch the project website in December 2004, Michael Christie summed things up this way.

"There are some common threads that run through the work that we're doing, but ultimately we're starting off with people on country doing what they're doing using digital technologies and then finding good ways of helping them to do it. And at the same time, helping to understand what the digital technologies they are using are doing there, and maybe ways in which they are actually steering people in a direction they don't actually want to go. We begin with ways in which people are actually creating solutions for themselves using particular pieces of software, and ways in which their work of using computers and digital technologies are somehow integrated into the ordinary, everyday routine practices of grandparents talking to children, and grandchildren, and people being in country and learning and talking.

The crucial point about the way in which it's turned out that the research developed, was working from that notion that Aboriginal knowledge is always local and performed, it's integrated in lands and peoples and the lives that they lead, so that in fact, as soon as you try to think of one solution that is going to work for everybody, you're already starting to compromise some people's agendas, some people's histories, some people's contexts. So the visions and agendas of the different groups of people always arise from their histories and their contexts. So as it turned out we started working with half a dozen groups of people and they all had their own aims, and their own problems, their own projects, their own ways of using digital technology already, or the ways in which they wanted to do it."

Michael's description of our work here harks back to

> A feminist objectivity as a starting point for an alternative conception of what the responsible production and dissemination of new technical artifacts might be...Located accountability is built on what Haraway (1991: 191) terms "partial, locatable critical knowledges." As she makes clear, the fact that our knowing is relative to and limited by our locations does not in any sense relieve us of responsibility for it. On the contrary, it is precisely the fact that our vision of the world is a vision from somewhere, that it is inextricably based in an embodied and therefore partial prespective, which makes us personally responsible for it. The only possible route to objectivity on this view is through collective knowledge of the specific locations of our respective visions. (Suchman, 2002: 96)

We go on now to exhibit three texts that conjure up a particular episode of *IKRMNA* work. We use these juxtaposed texts to exemplify the work in one of our 'emerging solutions.' The texts evidence our claim that *IKRMNA* can be read as a Garma ceremony and/or as an agential methods assemblage, proceeding as 'partial, locatable, critical knowledges'. Set within the performance of this paper and the project website the texts show *IKRMNA*'s collective acting as the working of a complex scenario.

Our first exhibit is a software requirement document we put together in January 2005 (IKRMNA 2005). The primary audience for this text is members of the complex world of software development. It embeds an image of a small database and file management system *Texts Audio Movies Images (TAMI)* in which we hope to interest others. In particular, we have in mind those people with access to funding sources, and 'code crunchers' who might be interested in the task of concocting it.

The second exhibit begins with a narrative about an episode of *IKRMNA* field-work in April 2004. The story was told by Bryce (and recorded and transcribed) in introducing *For the children* (IKRMNA 2004a) during the public meeting in December 2004 when the project website was launched. He describes working with Wulumdhuna at her

home in Djurranalpi, on Elcho Island in northeast Arnhem Land. The second part of this exhibit shows some of what emerged when Bryce returned to Darwin (IKRMNA 2004b). During conversations between Bryce, Michael, and Simon Niblock (then project manager) Michael started sketching interfaces for working with a database that had been made available to the project by Distributed Systems Technologies Centre (DSTC). Over the next few months the sketches of interfaces became specifications for *TAMI*, a very odd sort of database, as shown in exhibit 1. The DSTC database XMEG (Koopman, 2005), carried the conversation for some months and then dropped out of the picture. However it was only in November 2005, as this paper came together that we fully recognised the role it had played in bringing *TAMI* to life and that we had now abandoned it.

Exhibit 3 is an extract from a recorded talk by Wulumdhuna, transcribed and translated by Waymamba Gaykamangu and Kieren Myers. Wulumdhuna articulates her vision of how she wants to work with digital technologies to assemble an archive, properly formed within Yolngu understandings of what knowledge and archiving are, to enrich and guide the lives and identities of future Yolngu children (IKRMNA, 2004)

5.1. Exhibit 1: Software requirement document for *TAMI*

Description of the Problem: Why the software is needed

There are a number of initiatives that have begun to deal with the rapid loss of indigenous languages and traditions. Many of these initiatives are based on the model of the encyclopaedic archive to inform their development. Various groups have developed databases with rich metadata schema in an attempt to record and document oral knowledge traditions. One of the underlying assumptions of such systems is that knowledge can exist and be located within a collection through a priori ontological structures of metadata. The danger is that these collections become graveyards of objects which are no longer accessible to the practices of indigenous knowledge traditions, and that such knowledge is even more in danger of being lost. The reason these objects are grave-yarded is because they lose their multiple possibilities in real worlds as they take on a status by virtue of the metadata structure itself. The metadata actually determine the limits and possibilities of the object.

If we assume rather that knowledge is produced at the point of performance of situated understandings we come to the conclusion that the producers of knowledge are to be inextricably involved in its production and reproduction. We explore computing solutions that will allow as much as possible the owner/users to employ a simple and ontologically free system whereby they can produce, organise and re-purpose digital objects in ways congruent with their knowledge traditions. The objects do not contain knowledge, they represent traces of previous knowledge-production episodes which can become useful again in new contexts of performative knowledge making.

TAMI is a completely fluid file management and database system which bears with it no Western assumptions about knowledge and which maximises the possibility for the user to creatively relate and annotate assemblages of resources for their own purposes.

General Description

TAMI (Text, Audio, Movies and Images) is a database and file management system for Indigenous use. TAMI is cataloguing type software aimed at providing a visually based system for people to manage their own digital resources for perpetuating collective knowledge traditions. The focus is on an easy to use, assumption -free system, to view, organise, find, and assemble digital resources.

TAMI's objectives are

• to remain faithful to the principles and practices of indigenous knowledge production,

• to be useful for people with little or no literacy skills

• to store small collections of valued resources easily worked with and augmented for the purposes of collective memory making.

• to be ontologically flat: as far as possible it encodes no assumptions (through metadata structures) about the nature of the world or the nature of knowledge, it is the user who encodes structure into the arrangements of resources and metadata.

• for the users to become the designers as they bring together resources, group and order them, and create performances or products (like DVDs and printouts).

• so the ways in which truth claims are assembled and validated collectively within particular indigenous knowledge traditions, can be left fluid.

TAMI draft concept interface diagram
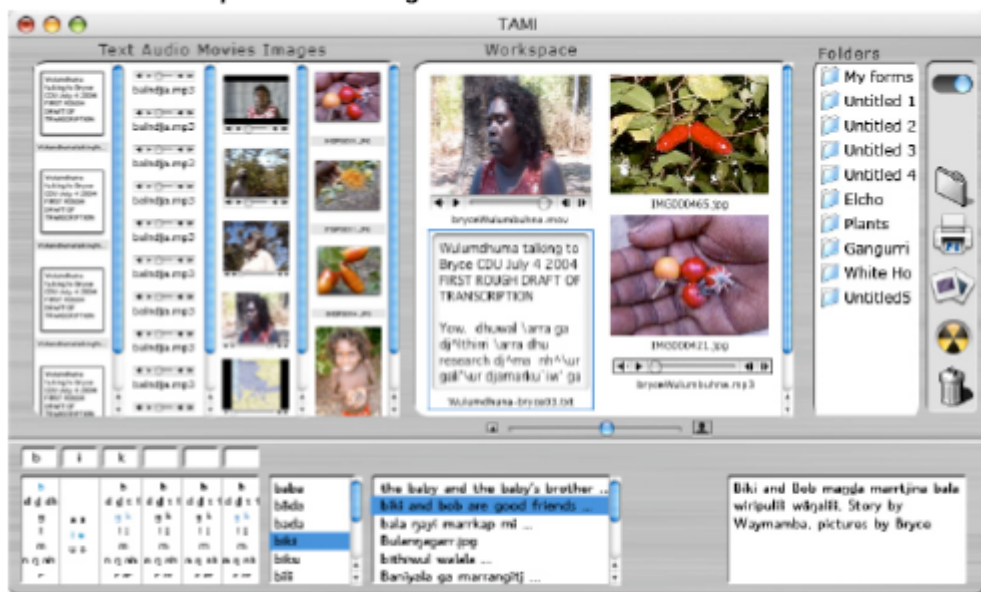
Features and Functions

• one single interface screen enables search, building presentations, upload, metadata creation and amendment and view.

• a workspace enables different objects to be viewed simultaneously, and arranged into folders.

• users will be able to upload resources into TAMI by a simple drag-and-drop

• the only a priori ontological distinction at work in the database is the distinction between texts, audios, movies, and images. Apart from that there are no pre-existing categories (as there are in other database where metadata are sequestered into fields such as 'author, 'title', 'subject'). This provides a certain ontological flatness so indigenous knowledge traditions are not pre-empted by western assumptions.

• objects can be uploaded and searched without metadata. (metadata can be added at any time. Its purpose is to help text-based searching)

• where there is metadata, there is a simple 1-1 relation between objects and metadata. Each object or assemblage has only one set of metadata and vice versa.

• however, individuals can make assemblages, (ie, 'folders' of resources) and give these folders metadata. So the database can hold collections of resources based on a theme and these folders can be labelled and found through text-search.

• the natural way to find objects in the database is without a text-string search, that is, without a text driven FIND function. Texts, audio files, movies, and images can be searched by flicking through the full set of thumbnail resources.

Text-based searching will also be available and is guided by a few principles:

• a glossariser produces a list of all the words which are already in the   metadata (including file names)

• the list contains English and vernacular words

• the list is always visible on screen

• users can scroll and click words for both instigating a search, and   adding metadata.

• key-in and drop down menus work to reduce the glossary list to help search. (key in b and only b- words remain, key in a and only ba-   words remain etc)

• metadata for objects displayed in the workspace can be altered at any time. The glossariser continuously updates the list of searchable words.

• wherever possible existing conventions from software solutions which are already familiar to indigenous users are employed.

Business and Financial

While the ARC Linkage Research project has employed funds to research user requirements and develop conceptual frameworks for TAMI we will be seeking to develop TAMI through securing specific software development funding. Charles Darwin University holds the IP which comes out of this research. (The IP over the indigenous content of any of our software systems is retained by the original owners). Initially we envisage developing a proof of concept animation of TAMI as well as a supporting functional specification document and budget. We are seeking funding to continue the development to the point of useability testing and deployment of an initial version.

Description of software solution

TAMI is envisaged as an application window that will provide a view of digital resources stored on the computer. The TAMI drag and drop window interface will allow for collections of resources to be made and presented in various ways. Thumbnails of resources will provide the main organising form and options for text based metadata and searchability will also be available.

Competitive analysis

A number of software products are already available that have some of the functionality that TAMI is seeking. Notably the Apple iLife products are already successfully in use in similar contexts to where this project is working ie in small indigenous communities. iView Media is another 3rd party product that has some of the functionality that TAMI seeks. The key aspect where TAMI differs from all these solutions is that TAMI integrates them into one, and implementing a unique approach to text (metadata) production, search and modification.

5.2. Exhibit 2: Bryce's story of working with Wulumdhuna

Part 1: A story about being on Elcho Island.

There's a track that runs all the way up the island and about half way, just off the track there is an outstation, Djurranalpi. It's one of the outstations where people live all the time, not very many necessarily but there's always somebody there. And there's a little schoolhouse there, and it's been there for some time.

Wulumdhuna, the lady that I've been working with up there is actually the family I'm adopted into in a sideways sort of a way. For a long time now she has been making scrapbooks with pieces of paper of different colours. She's been trying out patterns, trying to show the kids how they relate through places. She's been making resources by collecting bits together for the kids

that come to the school. These diagrams and collections reflect the ways she wants kids to think about places and their connections in Elcho, if you like. Rather than always using the text books that come from other parts or whatever.

She's already done a lot of work like that and as she's been working with the Education Department she's been getting experience with computers. And just recently, we've managed to convince the main school on the island that they didn't need one of their computers that they hadn't used for some time. They agreed to let us use it for a while.

So Wulundhuma is using this eMac, which comes with a variety of software built in like iMovie, iPhoto—quite simple organising programs. So now she goes out and she takes photographs of the plants and places and whatever and she brings them back, plugs into the computer, the iPhoto pops up automatically. She organises the photos into different folders.

For example she will put a place name of a rock that is part of a turtle story, and then have a folder that contains digital objects like photos of the rock, turtle photos, photos of plants that relate through various narratives. These are all in iPhoto. She will add a video of someone talking about that place to the folder. Maybe an image of a related painting will also be added.

Working with her view of how a collection of digital objects expresses places she will make up various folders. It might be that she took one photograph of a particular thing but has because it is multiple things, in different places and stories it belongs in say three different folders. That one photograph would go into each of the three folders.

 Depending on which storage/collection she was putting it into there was a bit of a problem with the data file. In that every time she wanted to locate the same image differently it would change the name. It had a different name every time even though it was the same photo. Then the names in other folders would change. The program kept trying to second-guess her and messed things up by changing names. We've been sort of trying to get around issues like that which arise in just using proprietary-based software.

......

For me one of the interesting things that happens [in these situations] is that once we have some videos and photos we go back to the computer. There'll always be a lot of time where you will spend say one second with the computer and then you'll spend the next hour talking about something that that's referenced. And the kids will be there and the old man will get called over and he'll talk about such and such. Then we'll have to go back off down the beach somewhere because there is another area that needs to be included and we might as well do it right now because it's a beautiful time, because it's low tide or whatever. So usually we don't actually spend much time with the computer, but we try to go to it, and a lot of the time we end up off doing other things so in effect in the process of having this computer there and attempting to do something with it is creating all this activity around the things that it is theoretically for anyway.

Part 2: Some drawings and comments made back in Darwin
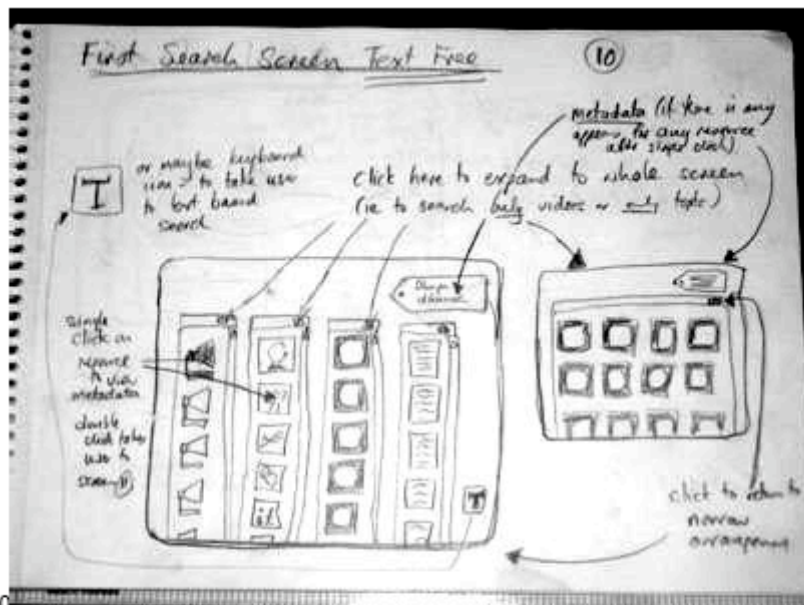
10

new opening screen. Text-free searching.

Option for text-based search available from here, but first search options are text free.

Four columns with sound files, videos, images and texts. (Bryce later added another column for folders (which contain collections of resources - see pic 13). If we pursue this option (see discussion in section 4), we need to think how it can be organized, and whether to folders have logical arrangements (sequences, time lines etc possible - to recreate journeys through the environment)

Each stack can be clicked up top somewhere so it opens out to a wider view (so user can search only for texts, videos etc if that's what s/he knows s/he is looking for) as displayed on rhs of graphic.
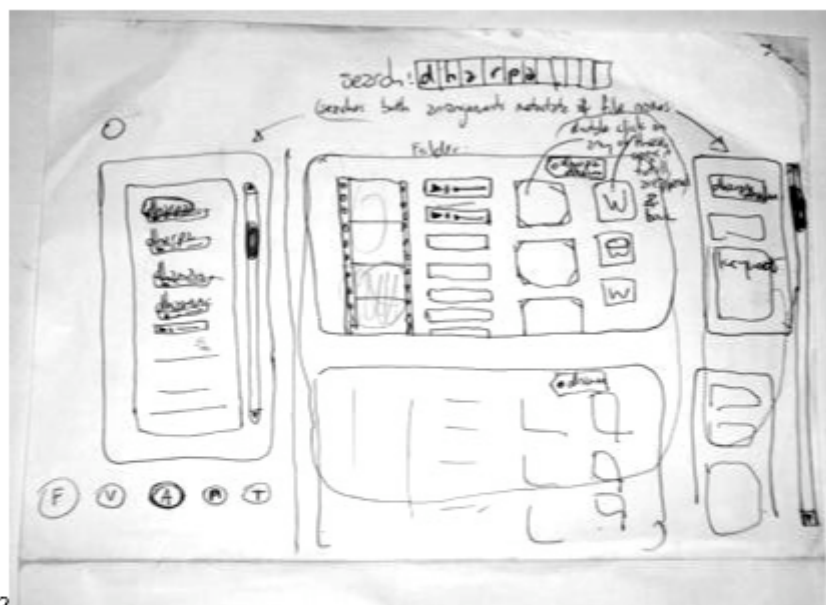
12

Bryce works on computer

need to discuss issues about complexity with first introduction to interface. Users will soon enough become familiar and have visual prompts at all times, starting to think about the object of the database to be arrangements of resources. focussing on ideas of how to include the maximum number of resources into the simplest most possible interface. and incorporating searchability and display into this.

then we started thinking about putting it all together and how folders might be created
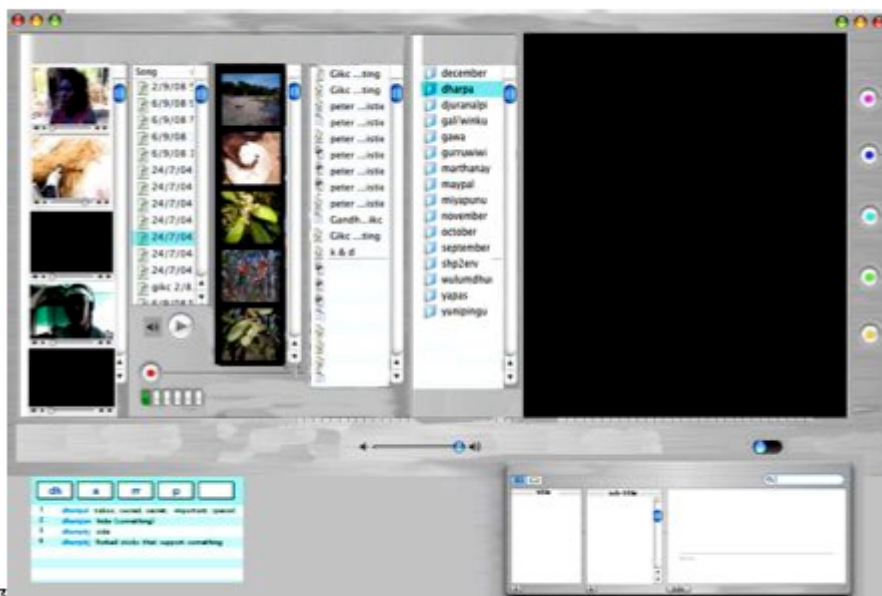
resources, (currently audios movies photos text), folders and workspace arranged from left to right. buttons along rhs*.

BAK An item from any of these resource banks can be selected and moved into the collection panel on the rhs. at which point metadata can be added specifically for each collection. (It should be noted that metadata for any particular resource can be added using the same metadata screen on the lower rhs,) * Once collections of resources are considered complete buttons on the far rhs indicate whether a folder, CD rom, DVD, or other export presentation is required to be produced.

Example, selection of the DVD export function produces a DVD which incorporates a slideshow of photographs, option for movie play, text scrolling, (including separate text scrolling for metadata and this possibility of listening to any audio files which have been included. Software limitations would presume a basic template for this function. Similarly a CD rom could be produced. or VCD.

BAK: The concept of a database has its substrate predetermined by past models of databasing. Experience with indigenous people over the last few months in the project has informed us that requirements of continuing narrative uploading (or something like that) are desirable. MC: by 'narrative uploading' do you mean resources connected by some sort of narrative logic which is encoded in the metadata?

5.3. Exhibit 3: Wulumdhuna's vision for a digital archive

1:47 Ga dhuwanydja ŋarra dhu dhiyal bala runu'runukurr starttja boŋguŋ ŋurru-yirri'yun ga projecttja djäman.	So I will start with the islands, the ancestral performances will start the work.
1:56 nhäwiku rra ga djälthirri, walal dhu boŋguŋ rrakal ŋaḻapaḻmirriy dhuḻaŋ djäma, biḏi'yurr dhulaŋ wäŋapuy	What I want, is soon, my elders, will produce ancestral images, paint the old art of the land.
2:09 yän balanya nhakun yolthu bumara ŋunhiyi wäŋa nhä ŋulayi marrtjin	just like, who made that place, what passed through there
2:21 yä balanya mala, nhä ŋulayi marrtjin, nhaliy ŋayi bumar ŋunhiyi wäŋa	and those things, what went through there, what it was that formed that place.
2:29 dhulaŋ, maṉda dhu dhuḻaŋ ga dhäwu, ŋayiny ga dhäwuny' marrtji rrambaṉi maṉda	Art, together the art and the story, the story will go too, both of them.
2:37 dhäwu dhu boŋguŋ gäna ḏapmaraṉ ga	Stories will be recorded in different

dhuḻaŋ biḏi'yunawuy wäŋalil mala ga gäna	places, and art painted of land, and together,
2:51 ga dhäwu ŋayi dhu ga ŋorra ŋunhiwiliyi dhulaŋ, dhulaŋŋur ŋayi dhu ga dhäwu ŋorra	the story will lie there with the art, in the image the story will lie
3:02 marŋgithinyaraw djamarrkuḻiw' ga manapandhi ŋapa-ŋupan(follow) ŋayi dhu, ŋunhiyi dhäwu buŋgulyu ga manikayyu	for letting the children know. And joining in, that child will follow, that story of the performance and the song
3:16 wanhami ŋayi dhu wäŋaŋur ga manikay marrtji, ga wanhami ŋayi dhu buŋgul mala dhawaṯthun ŋunhiliyi waŋaŋur, balanyaraw	wherever that song will wander, and from where the performances of song and dance will emerge, in that place,
3:25 ga yalalaŋumirriynydja, bala linktja mala djäma mana'manapula balanya nhakun example ŋarra dhu ḻakaram	and later make links and join them. I'll give you an example.
3:38 dhiyal, Djurranalpi, dhuwalnydja dhuwandja Djurranalpin wäŋa ŋunhi ŋarra li ŋänha'ŋanha (hearing) ŋunhi ŋayi ga bumar dhuwal wäŋa wuwarkuy	Here, at Djurranalpi, this place Djurranalpi I have always heard that this place was created by wuwarku snake
3:53 ga link ŋayi ga ŋorra dharrwa mirithirri, wiripunydja bäpurru'lil	and there are many many links, to other groups
3:59 dhuwal wäŋa Burrthi dhuwal Gayawala Wirrmuḻmuḻ ŋunhi ŋayi bumar dhiyaŋiyi bäpiy wäŋa	this place the Burrthi Gäwala Wirrmulmul snake created,
4:09 ga yalalaŋumirriy ŋayi dhu linkdhuwali marrtji boŋguŋ maṉda ḻirrawuthana ŋunhi ŋayi gan nhäŋal ḻirrawuthanalil ŋayi nhäŋal dhipuŋur	and later there will be links made to the lirrawuthana. The lirra-wuthuna saw from over there,
4:23 ga maṉda gan waŋanhamin, ŋunha bala bäpi ga dhiyal	and they were speaking to each other, that snake and this one.
4:30 Yä balanya mala ŋunhi yalalan. Ŋarra dhu dhiyal bala gali' ḻuŋgurrmaŋur starttja	Those things would be for later. I will start just in this area, ...
6:04 ŋayipi dhu yothuy dharaŋanmirr nhänhamirr wanha ŋayi, wanha ŋayi ga ŋorra ŋamini wo wayirri wo yapa'mirri nhanŋu wäŋa or wiripu wiripu mala	He alone, that child, will recognise himself, see himself, where he is, where he is and where his mother or his grandmother land are, and other things, like that.
6:22 ga balanya, ŋayipi dhu maladjarr'yurr ŋuruŋi yothuynha, dhiyakidja ŋarra ga purposetja dhuwal djäma ŋayi dhu, yalalaŋumirriy marŋgithirr, yalala dhu limurruŋ ŋaḻapaḻmirri dhawar'yun (finish) bala ga limurr dhu dhunupa (straight) yän walalany marŋgikuŋ, djamarrkuliny' ŋunhi.	He will be able to make sense of it for his own self, that's the purpose of it, the idea I made. They will understand. When our elders pass away, then straight away it will be able to let them know, those children.
6:36 dhiyak ŋarra ga dhuwal djäman, dhuwali rraku projecttja, ga dhiyaki ŋarra li ga warguyundja yalalaŋuw djamarrkuliw. Ga liŋgun dhuwal	That's what I'm working for, and that's what I'm worried about, later for the children. That's it for now.

5.4. Reading our exhibition of *IKRMNA*

In making its argument this paper has juxtaposed three elements as analogues: a description of the Yolngu Garma ceremony and its uses in secular settings, the 'after ANT' account of performative knowledge making as the work of agential methods assemblages, and an episode of *IKRMNA* research exhibited as three of its working texts. In this final section we read this exhibit through the interpretive lens made by the other sections.

In the arena conjured into life by these three texts and their juxtaposition here we see the workings of two rather separate, informal secular Garmas. Our exhibit works backwards. First we show a particular presencing, an opening-up: the software specifications for a file management system—TAMI. It proclaims itself as refusing to take digital archiving as a type of one-many collecting where each digital object is set within a hierarchy of specifying meta-data. It has Othered that 'law' of digital archiving "Content which is not described is useless" (Hunter 2005).

At the same time it has 'absenced.' Nowhere in the text are the roles of Wulumdhuna and her family at Djurranalpi (and the people who we are involved with in the other places where we work), made explicit. Glimpses remain for those who are in the know, in the faces, hands and fruits that feature in the mock-up. The episode that acted as a crucial stimulus in 'clotting' our vague struggles towards doing collective memory with digital tools with ontological fluidity and openness receives no mention. Absenced too, but again still traceable is the DSTC database XMEG, and the work of designers

As the name *TAMI* came to stand-in for an interface design that became an archiving tool, it brought to presence only some of the messy socio-technical work of designing digital file management systems. Foregrounded is some of the political, ontological, and sociological argument which justify it. Coming up with the acronym T.A.M.I. as a felicitous name and a sketched image of a computer screen, signalled the 'birth' of *TAMI*, new grounds on which to proceed. A galtha could be proclaimed. *TAMI* as a design of a digital file making system with fluid presencing/absencing/Othering built in, will allow multiple and heterogeneous galtha, and multiple possibilities of justifying them.

The second text shows how people are letting themselves be directed, going here and there as the autochthonous Yolngu methods assemblages choreograph the performance, and a new type of secular, collective knowledge making process flutters into life in places around Djurralpi. We get a picture of life at Djurranalpi and imagine the eMac in the corner of the busy sitting room of a small corrugated iron house. During Bryce's visits, and also sometimes when he's not there much to-ing and fro-ing happens between the computer and people doing things out on their country. Digital items are collected, always involving places and the people whose places they are. In the sitting room there is much talk as items are disposed and composed in various drives on the hard drive. Talk about names, (How will we spell that?) stories, Ancestral Beings, (Do you remember the honey we found there last year?).

There are hints of a galtha in Wulumdhuna's coming up with a name for her project 'For the Children'. Maybe Wulumdhuna's project at Djurranalpi will in time find/be given a Yolngu name. If we get funding for to support the little community of Djurrnalpi in assembling digital objects, capturing texts, audio files, movies and images in their projected series of in-place, bodily performances of singing, story telling and painting, things might begin to gather momentum.

The digital Djurranalpi methods assemblage works sometimes in a crowded, rather hot room and old man dozing on the sofa, his friends and relatives chatting and smoking out on the verandah, children tumbling around, a young woman with, some computer skills, a borrowed computer and a vision, a story, of how to keep memories of those old men and their knowledge fresh for the children, to nourish them. Places visited, small boats and trucks, and stories told of past and future ceremonies with dance and

song and painting. Small beginnings of a secular Garma flows and swirls through the computer which is a crucial new passage point. Things gathered, and held as themselves grouped only by the techniques that make them digital things (texts, audio files, movie clips, still images) ready and waiting to be re-grouped and come to life as the expression of some aspects of some future child's specific and particular identity.

What of the third text? What is its role in our exhibition? Wulumdhuna's statement of her 'vision' articulates a frame for IKRMNA. This guides us in designing our agential methods assemblage. It helps us see and justifies our Othering of the 'code-crunching law' of metadata previously untroubled in indigenous knowledge archiving.

1. Practice based research is currently emerging in areas of knowledge management but perhaps most significantly in the digital and multi-media design industries (see the recent edition of Digital Creativity Vol. 15, No. 1, 2004.)

In the Australian context practice-based research was explicitly endorsed by University of Technology Sydney (UTS) as its preferred methodology in responding to an Australian Government white paper outlining policies to promote innovation (see http://www.backingaustraliasfuture.gov.au/submissions/issues_sub/pdf/i250.pdf.)

Advertising a 2005 conference captures much of the sense of 'practice-based research' in Australia currently: "Practice-led research is increasingly being adopted by research and development managers in the knowledge based industries. Almost daily there are breakthroughs and challenges to methodology, ways of organising research processes and the forms of research outputs (Speculation and Innovation Conference 2005. Applying Practice-Led Research in the Creative Industries http://www.speculation2005.qut.edu.au/index.html).

2. Helen Verran, Michael Christie, and Trevor van Weeren participated in this episode.

3. The IKRMNA website (http://www.cdu.edu.au/centres/ik) has been assembled in such a way that our work can be read in this way. This approach was unexpectedly validated when we were contacted by a research from Norway who had used material from our website in evidencing an argument about 'doing difference' in generating base code (van den Velden, 2006).

Acknowledgements

References

Bauman, Z. (2002) Society under siege. Polity, Cambridge.

Bennett, J. (2005) The agency of assemblages and the north American blackout. Public culture 17 (3):445-65.

Haraway, D. (1991) Situated knowledges: the science question in feminism and the privilege of partial perspective, Simians, Cyborgs, and Women. Routledge, NY, 183-201.

Hunter, J. (2005) Software tools for indigenous knowledge management. http://www.dcdsca.nt.gov.au/dcdsca/intranet.nsf/Files/CA_StrehlowDocs/$file/JaneHunter.pdf Accessed 27/11/2005

IKRMNA (2004) Wulumdhuna talking about her project. http://www.cdu.edu.au/centres/ik/pdf/djuranalpi.pdf

IKRMNA (2004a) For the children. http://www.cdu.edu.au/centres/ik/db_ftc.html

IKRMNA (2004b) 1st draft of software requirements for TAMI. http://www.cdu.edu.au/centres/ik/pdf/tamiPIX.pdf

IKRMNA (2005) 2nd draft of software requirements for TAMI. http://www.cdu.edu.au/centres/ik/pdf/TAMI_soft_spec060105.pdf

Kaipainen, M. (2004) Practice-based research at the University of Art and Design Helsinki. Digital creativity15(1), 8-9.

Koopman, B. (2005) Indigenous Knowledge Management Project. http://www.metadata.net/ICM/ and http://www.metadata.net/ICM/xmeg/docs/ Accessed 28/11/05.

Latour, B. (2005) Reassembling the social and introduction to actor-network theory. Oxford University Press, Oxford.

Law, J. (2004) After method mess in social science research.   Routledge, Abingdon.

Law, J. (2006) Actor-network theory. In Encyclopaedia of Sociology,

Law, J. and Hassard, J. (1999) (eds.) Actor-network theory and after, Blackwell Publishers, Oxford.

Maffi, J. (2005) Ethnoepistemology. In Fieser, J. and Dowden,B. (eds.) The internet encyclopedia of philosophy. http://www.iep.utm.edu/

Marika-Munungirritj R (1999) The 1998 Wentworth Lecture. Australian Aboriginal Studies (1) 3-9

Ngurruwuthun, D. (1991) The Garma Project. In Aboriginal Pedagogy: Aboriginal Teachers Speak Out. Geelong; Deakin University Press 107-22

Prophet, J. (2004) Re-addressing practice-based research: funding and recognition. . Digital creativity15(1), 2-7.

Suchman, L. (2002) Located accountabilities in technology production. Scandinavian journal of information systems, 14(2), 91-105.

Thomas, M. (2004) Practice-based research. Digital creativity 15(1), 1.

van den Velden, M. (2006) Culture, ethics, and information technology. Ess, C and Hongladarom, S.S. (eds.) forthcoming

Yirrkala School (1996) Living maths: the garma mathematics curriculum of Yirrkala Community School. Set of four videos produced by Merle Thornton, published by Boulder Valley Films, distributed by History and Philosophy of Science, University of Melbourne, Australia, 3010.

Yunupingu, M. (1990) Language and Power: the Yolngu rise to power at Yirrkala School. In: Egginton. W and Walton, C (eds) Language Maintenance: Power and Education in Australian Aboriginal Contexts. Darin: Northern Territory University 3-6.