Transnationalism, Indigenous Knowledge and Technology: Insights from the Kenyan Diaspora

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ABSTRACT
Our paper investigates how current digital technologies are sufficient, or insufficient, in supporting Kenyan transnationals in practising indigenous knowledge. We first outline a view of indigenous knowledge, and then apply it to a study of Kenyan diasporans living in Australia. The findings are framed as nine techniques for sustaining displaced practising of indigenous knowledge. These appropriations suggest directions for technology innovation, providing design considerations for technologies that translate, formulate and support indigenous knowledge in transnational contexts.

Author Keywords
Traditional knowledge; indigenous knowledge; Transnational HCI;

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Transnational HCI is principally concerned with how technologies are designed, used and appropriated across different geographies and cultures [24, 29]. Related to this, but with a different focus, studies of *indigenous knowledge* (IK) within HCI investigate technologies that support indigenous communities in sustaining their ways of living and knowing when they are physically or generationally separated from their indigenous land and wider community (e.g. [14, 21]). In this paper we explore the nexus of these two areas and investigate how existing digital technologies support transnationals in sustaining their IK. Based on previous research that highlights the inconsistencies that arise when indigenous knowledge systems are designed from western logics [6, 27], we posit that an understanding of the transnational indigenous user of technology offers a valuable perspective on how technology can connect or marginalise users with indigenous ways of knowing. We investigate how existing technologies connect or isolate indigenous transnationals wishing to sustain indigenous knowledge in a diaspora community.

Our approach is to start by proposing a definition and perspective on indigenous knowledge. We then apply this lens to generate findings from an ethnographic study conducted with Kenyan transnationals in Australia. Based on these findings, we develop insights for the HCI community in the following ways: articulating a nexus between indigenous knowledge and transnational HCI, and thereby articulating a focus on the indigenous transnational user; offering an indigenous lens to technology design that can be used as a framework to motivate IK research and design; and identifying gaps that technology can fill in order to better support the practise of indigenous knowledge among indigenous transnationals.

CHI 2015, April 18 - 23 2015, Seoul, Republic of Korea

ACM 978-1-4503-3145-6/15/04…$15.00
http://dx.doi.org/10.1145/2702123.2702488

BACKGROUND

Technology and transnationalism

Transnational HCI concerns the ways 'social and cultural interconnectedness and mobility across space, time and geography' impact technology use and design [24]. Areas of investigation include observing how pervasive and ubiquitous technologies gain new forms and uses when transported to new places (e.g. [15]). Significant theoretical questions have been raised about how transnationals appropriate technology, and the interplay of new technologies with mobility, hybridity, identity, culture, and local-global interconnectedness[24]. These studies offer insights into how to design for people who are highly mobile, and yet remain 'anchored', culturally and socially, both to their countries of migration and their countries of origin [29].

Specific projects in transnational HCI have examined, for example: the use of mobile technology by Thai retirees across distributed homes in different countries [29]; the use of technology by diaspora Ghanaians to connect with foreigners in the diaspora [7]; how Kenyans use technology to communicate within rural, urban, peri-urban and diaspora settings [20]; and, how online gaming in urban China becomes socially and culturally situated [15].

Technology and Indigenous Communities

In a different area of research, a variety of technologies, e.g. [17, 25], have been designed specifically to facilitate the collection, translation, validation, preservation and dissemination of indigenous knowledge (IK). While this produces valuable records, the approach has often been critiqued as being unfavourable to IK's growth and sustenance [22, 28]. Agrawal [2] and others argue that the attempt to collect and preserve IK assumes that IK is easily 'collectable' and 'preservable'. This 'scientisation' of IK tends to consider IK as a commodity that can be abstracted and decontextualized, and that its significance can be readily maintained outside of the socio-physical environment of the indigenous community.

This is not to deny the significance of archiving. For example, the preservation of audio recordings of endangered languages, the storage of video archives of ritual ceremonies, or the creating a digital herbarium of an indigenous people's flora are all important. These become collections that can be recreated, studied or referred to, and additionally be actors in the future generation of IK. However, they are not the entirety of IK, nor are they immediately valuable to indigenous communities themselves. There is therefore an opportunity and a need for technology design to move beyond managing indigenous data, and into supporting the nurturing of IK.

Indigenous Data and Indigenous Knowledge

In the field of knowledge management in western organisations, collections of images, numbers, words and sounds arising from observation or measurement are most accurately considered as data, where data is understood in contrast with more meaningful information and knowledge [13]. When such collections are derived from indigenous communities, this paper similarly refers to them as *indigenous data*. While indigenous data is important and serves various purposes - scholarly, ceremonial, scientific, commercial, and entertainment – it is primarily an abstraction at a particular time and location. In contrast *indigenous knowledge* arises from social and physical interactions amongst the people, and with their environment. Indigenous knowledge is retained and refined through time by an indigenous community in order to sustain its unique identity. This knowledge makes up the community's ways of being, living and knowing[4, 21].

While this view of knowledge as being social, materially grounded and situated, is not new to HCI [12], few IK technologies reflect this perspective. Nevertheless there are a few notable examples of technologies that attempt to cultivate indigenous knowledge: a mobile knowledge sharing platform that allows *in situ* community members to create a media rich visual representation of their environment [14]; a reality game that allows users to practise indigenous knowledge within digital representations of their indigenous environment[21] ; and the use of indigenous objects to enable the learning of IK within a mixed-reality space [18].

It is within this shift – from preserving indigenous data to cultivating indigenous knowledge – that this paper positions itself. This shift not only views knowledge as a social, physical and situated process, but also aims to mediate the indigenous ways of interacting with, developing and negotiating knowledge. We explore these issues in the context of a diaspora community, where cultural dispersion and social isolation often accentuate the challenges of practising IK. But first we clarify our perspective on indigenous knowledge.

THE THREE "P"S OF KNOWLEDGE

In developing a view of IK, it is important to emphasize that it does not stand in opposition to scientific/western knowledge. In a critical analysis of this supposed dichotomy, Agrawal [1] contrasts the two knowledge groups across three themes – substantive, methodological/epistemological, and contextual - and concludes that no clear divide exists between them.

Also, while IK can be viewed as a 'complete body of knowledge, know-how and practices maintained and developed by peoples through generations'[17], its inseparability from the indigenous community carries with it the uniqueness of each of these communities. Indigenous communities are not all similar, and consequently, not all forms and definitions of IK are identical.

Additionally, IK may be viewed as both a product of the knowledge of an indigenous community, e.g. indigenous languages, artefacts and practices, and as an approach to understanding how knowledge is created, shared, stored and developed among indigenous communities. IK brings an indigenous perspective to how we approach and respond to knowledge, particularly the knowledge of indigenous communities. Our intention is to understand how an indigenous view of knowledge may influence the design of technologies intended for indigenous users. We begin by explicating an indigenous view of knowledge that proposes three important foci: *people*, *place* and *practise*.

Practise as knowledge

According to epistemologies applied by indigenous communities, knowledge is acquired though lived experiences and primarily involves face-to-face interactions with other people [10]. Meaning is gained through situated socio-physical interactions with nature, people and objects. These interactions are not only oral or written, but bodily - movement, gesture, voice, dances, stories, performances, rituals, pitch, smell, texture, sound, role- based interactions etc. This view echoes the phenomenological view of knowledge as embodied - meaning is gained by being in and interacting with the world; the mind gains meaning of the world by virtue of the body being in that same world [8].

This indigenous epistemology is well illustrated in a study involving a 3D visualisation tool with an indigenous community in Namibia [14]. When asked to identify his house from a bird's eye representation of his village, one respondent replied, "*I have never been on my roof, so how should I know how it looks like?"* The respondent determined that he could not possibly know what his roof looked like because his body had never been on the roof. Knowledge of a place or activity was only possible by being in and interacting with that place, or actually performing that activity.

People as knowledge

Many indigenous communities apply the aphorism "*I am because we are*" to the way they live, be and know; the individual is not at the centre of the world, instead the community has primacy in terms of identity and knowledge[19].

Knowledge is seen as belonging to the entire community. However, access to knowledge and the enactment of knowledge varies within and between communities. Some community members have privileged access to certain knowledge depending on their role within the community. For example, among the Maori, the role of 'official knowledge bearer' is assigned to particular members [10]. This means that members of the Maori tribe have to interact with these living repositories of knowledge in order to learn particular skills, histories, and practices. Another example is from the Penan community, where the youth embarked on knowledge sharing journeys with the elderly in order to learn essential life skills like cooking, hunting, and fishing [25]. In rural Namibia, villagers often described their wisdom in terms of social relationships with key members of their community [4].

For these indigenous communities, knowledge is viewed as being shared, applied and contained in and through people. This has a consequence on the approaches that tend to make knowledge abstract and remove it from an identifiable voice/body.

Place as knowledge

The relationship that indigenous communities have with their ancestral place of settlement (i.e. the land on which they believe they first settled) is paramount in understanding indigenous knowledge. For example, it is common in African countries for each ethnic community to have a clearly identifiable land area from which they believe to have originally settled. In many instances, the ancestral land of an ethnic community remains the land on which it is the largest occupant of in the country. These spaces therefore become rich environments of indigenous knowledge due to the high concentration of people from one ethnic community, living their indigenous practices *in situ*. Even community members who live beyond ancestral lands (e.g. within a city) may still maintain a connection to the ancestral land, and this connection is "resilient, highly variable, with dynamics of its own, and not just dependent on personal choice" [11].

The relationship to the ancestral home is transcendental and perpetual, and facilitates an understanding of a community's ancestral land as more than a place of settlement. Instead, the ancestral land plays several roles: it is a place of identity[11]; an active participant in the socio-physical interactions of the community – an actor in the process of knowledge construction[4]; a keeper of knowledge, with whom interactions are necessary in order to acquire that knowledge[21]; a sacred gift to be cared for and respected; and a determinant of what and how knowledge interactions and exchanges can take place[21]. The ancestral place acquires a pedagogical role in their expression of indigenous knowledge.

A STUDY OF TRANSNATIONALISM, INDIGENOUS KNOWLEDGE & TECHNOLOGY

To explore the significance of the P-P-P view of IK, as described, we conducted an ethnographic field study of 8 Kenyan diasporans living in Melbourne, Australia. The aim was to study people in a geographical dispersed diaspora while attempting to practice IK from their distant homeland. This provided a site of study within the nexus of transnationalism and IK. The focus, for each participant, was on understanding how transnationalism challenges the way indigenous knowledge is practiced in the diaspora, and on how technologies play a critical role in negotiating these challenges.

We are interested in how technologies are culturally appropriated, specifically how 'people adapt and make technology their own', and the new ways in which technology gains meaning depending on the social, political and economic context of use[16]. Cultural appropriation does not merely examine how western technologies are domesticated in their indigenous cultures, but in the ways that technology 'is framed and articulated, that is, transformed, not as a technical artefact but as a cultural object.'[16].

While a diaspora community is different from an indigenous community, we applied our P-P-P lens to study Kenyan transnationals for three main reasons. Firstly, we are interested in matching an investigation of IK with a view that reflects an indigenous epistemology. Previous researchers [27] and [6] have highlighted the inconsistencies that arise when IK systems are designed from western logics. We therefore find it fitting to apply an indigenous view of knowledge (the P-P-P lens) when investigating the sustenance of IK by indigenous communities. Secondly, as previously stated, transnational HCI allows us to examine how information flows might connect or isolate developed and developing nations[29]. We were therefore motivated to investigate how current technology connects or isolates members from developing nations who live in developed nations, and yet desire to maintain an active connection/identity to their countries of

origin. Lastly, we intend that investigating a diaspora community offers insight into how, and why, IK is practised when community members are separated, physically or generationally, from both their ancestral home and the wider ethnic community.

For these reasons, we conducted a study with Kenyans living in Melbourne, Australia. Our goals for research were threefold: to understand the motivations for sustaining IK in the diaspora; to understand the workarounds employed to practise IK; and to identify technology appropriations applied in order to continue practising IK.

Method

We conducted interviews with eight Kenyan women living in Melbourne, Australia. Our choice to investigate women was motivated by a respect for the customs of the traditional communities we intended to study. In indigenous communities, access to knowledge is often gender based. Our primary researcher (the first author in this paper) is a woman thus to study only allowed wider and easier access to both participants and the activities under investigation. Our primary researcher is also Kenyan, and familiar with the structure of Kenyan society and its bearing on our participants. Our existing relationships with technology research organisations in Kenya, and the ease of access to participants for future *in situ* studies further motivated our interest in the Kenyan diaspora. As advocated in [9], we considered our primary researcher's sentiments, understandings and familiarity with the participants as contributing to the research we undertook. For example, interviews were conducted both in English and Kiswahili, following a norm amongst Kenyans to code-switch between the two languages. Code-switching allowed for colloquialisms, phrases, sayings, and commonly understood norms to be expressed by the participants and understood by the researcher, thereby allowing for nuanced user requirements to be collaboratively generated.

Recruitment was by snowball sampling, thus half our participants knew each other. This proved advantageous in that the stories that recurred in our data were enriched and clarified through multiple viewpoints. Our primary research method was interviews, which were conducted at the residences or workplaces of the participants and lasted between one to three hours. In addition, pictures of traditional artefacts were taken in order to glean a richer understanding of how IK is transported and developed in places of migration.

Analysis of the data involved transcribing audio recordings of interviews while translating the Kiswahili parts into English. The data was then analysed through a P-P-P lens, where we interpreted how the social, physical and situated characteristics of IK were manifest in the reports participants. We identified the actions, interactions and workarounds employed by participants when attempting to sustain IK, sometimes during interaction with the people and places of their homeland. The identification of relevant elements in the data was motivated by asking how the development of IK related to people, place and practise. Under these three foci, we identified nine techniques for sustaining IK used by these Kenyan diasporans. The techniques all relate in some sense to combinations of people, place and practice, but we present them here as falling principally under one of those themes. The techniques identified were considered by the researchers as being highly relevant to the circumstances and intentions described by all participants, though not all reported using them.

Description of participants

All participants were women between the ages of 25 to 60, and had lived in Australia for between three and fifteen years. All were either employed or owned their own businesses. To note, we used the term traditional knowledge interchangeably with indigenous knowledge, as the former term was more meaningful to the participants. Table 1 briefly presents the demographic profiles of the eight participants. The next section discusses findings from the ethnographic study.

FINDINGS

We present our findings by first describing the motivations of our participants for sustaining IK in the diaspora, including an unexpected interest from the youth in IK. We then discuss the accommodations and workarounds made, with and without technology, to sustain IK through connections to people, place and practise. The gaps in what technology currently appears to offer, as we later discuss, present opportunities for improvements and new innovations.

Motivations: Identity, values and belonging

A key motivation for sustaining IK was the desire to construct a Kenyan identity amid the multiple other cultures that participants interacted with. There was a recurring concern that "Kenyans assimilate easily and forget their culture" (*Lucy*). Therefore, in order to sustain their Kenyan identities, including particular ethnic identities within the Kenyan nation, participants participated in activities such as attending Kenyan social events, maintaining active use of their national and/or ethnic languages, cooking Kenyan meals daily or occasionally, and keeping abreast with Kenyan news.

Participant	Age (yrs)	Description
Ann	25 to 30	Social worker; Has lived in Australia for 6 years; Last visited Kenya 10 years ago.
Shangazi	55 to 60	Nurse and business owner; Married with two children aged 25 and 29; Lived in Australia 15 years; Last visited Kenya in March 2014. Visits each year.
Baraka	25 to 30	IT consultant; Lived in Australia 3 years; Has not visited Kenya since being in Australia, plans to travel at the end of the year.
Lucy	40 to 45	Teacher; Married with two children aged 7 and 16; Lived in Australia for 8 years; Last visited Kenya 10 years ago. Visits Kenya about every decade.
Senge	40 to 45	Trainer, Business owner; Married with two children who are in their early twenties; Has lived in Australia for 10 years; Last visited Kenya 3 years ago.
Mariamu	40 to 45	Business owner; Married with three children (16 – 27 years of age); Has lived in Australia for 12 years; Last time in Kenya was in January 2014, visits approx. every 1.5 years.
Dada	35 to 39	Accountant; Married with three children, all under 8 years of age; Has lived in Australia for 8 years; Last visited Kenya 3 years ago.
Binti	25 to 30	PhD student and lecturer; Has been in Australia for over 5 years; Last visited Kenya a year ago.

Table 1: Summary of Participants (all names are pseudonyms)

There was a recurring perception that children were losing values due to living in new environments. Videos and documentaries about traditional communities were used to cultivate the learning of these lost values. We also observed that interactions and engagements around traditional activities provided a special site for the teaching of "traditional values". For instance, cooking of intricate traditional foods was coupled with storytelling where the cooking activities acted as prompts to pass on values that the teacher had learnt while cooking, and were reference points for the learner to understand a traditional value.

Another reported motivation for sustaining IK was to show belonging. The story below illustrates this:

> *"I remember when he first spoke to his future mother-in-law. His wife had called her mum in Kenya so that she could introduce her to the guy she planned to marry. He talked to the future mother in law on the phone in his limited Kikuyu language, blundering endlessly along the way but he persisted. Then the mother asked the daughter, "Is that man a Kikuyu really? You have to teach him the language if he wants to talk to me." Shangazi*

In this instance, the man in question needed to show the mother-in-law that he was a "true Kikuyu". This could only be demonstrated by the degree to which he could speak the Kikuyu language fluently. This pushed him to learn the language from his fiancé, in order to achieve a sense of belonging and approval from his future mother-in-law. This sentiment recurred across the participants, with many of them stating, "*Mkosa mila ni mtumwa*" (He/she without a culture is a slave).

We found a strong desire by the younger participants (aged <30 years) and the children of older participants (reported indirectly), to learn about their ethnic background and to practise aspects of their culture. One of the drivers of these interests was a feeling of having "missed out" on aspects of their ethnic or national background. This missing out was felt to be a result of having been physically or generationally separated from the place and people of their ethnic community.

Moreover, the knowledge sought by the youth was not only reserved to skill and language acquisition, but also about having an alternative reference point for everyday questions and activities. As summarised by *Ann*:

> *"I want to know the roots. Our roots, back at home. I don't feel bad that I cannot speak my ethnic language. I don't have sleepless nights about it. But when I am asked about my ethnic background, I can't say anything, and that is why I feel as though I lack and I would love to know more about that. Growing up, we weren't exposed to that… the things I do right now, would they be accepted? Would the elders give me a leso at my wedding?"*

According to *Ann*, her ethnic community, the *Taita*, only give a *leso* (a clothing item similar to a sarong) to women who the village elders or community members consider honourable.

There was also a preference for interactive experiences. In the case of learning about "the roots", there was a preference for interactions involving music, artefacts and activities. According to *Ann*, while many technology applications she had come across for learning IK often relied heavily on storytelling, other media within her environment, like video conferencing and interactive public displays, could offer more memorable and engaging experiences.

Limits of current digital technologies

A multitude of social media applications and communication tools were used by participants to connect

with the Kenyan and/or ethnic community. Common examples were Whatsapp, Viber, Skype, phone calls, forums, YouTube and email. These were used to facilitate various interactions, for example finding out what locally unavailable item could be replaced in a traditional recipe; organising life events with other Kenyans, e.g. birthdays and weddings; keeping up with news via Kenyan YouTube channels and online newspapers; teaching children Kiswahili via Kenyan- produced animations on YouTube e.g. TingaTinga tales; and crowd sourcing for information about a particular ethnic community or a particular practice.

While these technologies were found useful to an extent, the following findings indicate their limitations and opportunities for improvement, by describing the various related workarounds and techniques for sustaining IK that go beyond what is readily possible with these technologies of connectivity.

Interactions with people holding IK

Following the P-P-P lens, the first category of techniques to sustain IK are those that concerned connecting to people holding IK.

Physical encounters with people in the homeland

When searching for IK there was a desire to meet physically with elderly members of the ethnic community who were perceived as legitimate sources of IK. The story below exemplifies this:

> *We did a bit of Googling, my husband and I, but we did not get much from there about our ethnic community. So we have purposed that next time we go to Kenya we have to look for old men, old Kikuyu men to explain to us those processes because we realise we do not know them."Mariamu*

Such a meeting needed to be face-to-face given the importance of the people to be met, i.e. the elders of the village. Moreover, non-verbal interactions and feedback between the elders and the audience, constitute the learning that takes place in these physical encounters with knowledge bearers. Thus *Mariamu* preferred physical meetings with the elders given the wealth of learning it would offer and also an opportunity to sustain a relationship with the elders and her village.

Flying in experts

The converse of visiting elders in the homeland, was to arrange for visits to the diaspora. Our study revealed instances where elders, religious leaders and ethnic community members from Kenya, were flown out to Australia in order that they could chaperon a traditional ceremony.

> *"I hadn't paid attention to what the songs meant when I attended weddings in Kenya. At my wedding here, we had a lady from Kenyan who taught us the traditional songs of my tribe. Her and my mum arranged us accordingly, as per our customs, and we performed the traditional ceremony of wooing the bride out of the house."Lucy*

Here, knowledge experts were sought and brought in to guide the performance of a traditional ceremony.

Physical meetings among learners

Another technique of sustaining IK through its relation to people, was to create spaces and events for those in the Melbourne diaspora to meet with each other and to share their learning. Three participants were involved in launching and running a language school in Melbourne for children from the Kenyan community to learn Kiswahili. The school doubled up as a space of social interaction, where the children could meet, engage and practise their language.

Participants expressed pride in setting up a regular language school, as it was a visible means of passing "something down" to their children, and it gave them another reason to meet with each other. As noted by *Shangazi*, the school was also a physical avenue to the past as it brought connections to her childhood and reminded of the Kiswahili poems she used to sing.

Cultural apprenticeships

A related technique for sharing IK among those in the Melbourne diaspora can be described as cultural apprenticeships. Here members arrange to meet physically for the sharing of specific knowledge. A frequent site for this kind of exchange was during learning of highly embodied practices, such as the preparation of traditional meals. The story below exemplifies this:

> *"One of my friends said that before she leaves Melbourne in two weeks she has to come over for me to show here how to cook chapatis. I told her I could explain it to her over the phone but she has refused! I have explained to her before how to do it over the phone, but she said every time she tried cooking them, they were hard. So she insists on coming to do it with me." Shangazi*

Despite the availability and use of digital media to pass on knowledge, we observed a preference to 'learn by doing' in the presence of others.

Maintaining a connection to the places where IK is performed

The second category of techniques for sustaining IK are those that attempted to connect with the places of IK.

Visiting the homeland

Connections to Kenya and to participants' ancestral homes were maintained primarily by regular trips to those physical places. The need for these trips went beyond visiting friends and relatives, and included the need to connect with the places of IK. The prevalence of this technique confirms the importance of sustaining IK and reminds us of the limits of technologies to fully substitute.

Being there through digital connectivity

However a range of digital technologies were used for a secondary kind of connection to place. This was reported in the use of, for example, phone calls, Skype calls, Whatsapp groups, diaspora forums and Facebook pages. While these technology-mediated always involved connections to people, and very often to practices as well, it was clear in the testimony of participants that part of the value was in connection to the places of IK.

For example, in one reported case, to create a more immersive sense of 'being there' multiple channels of connection were used in tandem. *Baraka* watched a one-way live feed of a wedding ceremony online. SMS messaging was used to communicate with her family members who she was watching live. Additionally, she performed actions in unison with the wedding attendees, despite a 10-hour time difference; eating when they ate, and singing and dancing along to the traditional ceremonies being performed at the wedding.

Extending places of origin

We also observed how the connection to ancestral place was enlivened in the country of migration of the participants. We call this extending the place of origin, where the activities that would have been carried out in Kenya, are practised as they would have been, but in Australia. This is clearly also relates to the notion of IK through practice. But here we refer to the way the place of the homeland is felt to extend to the periphery of the diaspora. As described by *Senge*:

> *"Australia feels more or less like Kenya. After some time you forget that you are not in Kenya. I have brought my Kenya here." Senge*

By sustaining several IK practices in her life in Melbourne e.g. food, language, religious practices, community, radio, *Senge* was able merge her connection to Kenya with her current physical place. She augmented her indigenous practices from her place of origin to her place of migration. HCI provides some examples where the lived world of indigenous users has been virtually merged with their indigenous home. For example, Digital Songlines [21] which is a game that allows the indigenous user to be immersed in a virtual world that closely resembles his/her own ancestral land. By simulating place, Digital Songlines provided a means through which users could invoke knowledge about their indigenous land, the fauna and flora, and the events that transpired on the land. Similarly, *Senge* cooked Kenyan meals daily, listened to Kenyan news and music, used artefacts from her country of origin and maintained use of her traditional languages, in order to recreate her home of origin into her new home.

Enacting the practise of IK

The third category of techniques for sustaining IK are those concerned with the direct adoption of practices that embody and depended on IK.

Pre-learning indigenous practices

One technique occurred before participants left Kenya. Knowing that they were to migrate, they deliberately learned new aspects of IK that they would need in their new life. For example, *Mariamu* decided to learn how to braid her children's hair before moving to Australia, where she anticipated that she would not have easy or immediate access to the practice:

> *"I am undoing my hair now so that it can be redone by a friend, into an African hairstyle I like. I used to do this for my daughters when they were younger.. I learnt it in Kenya because I knew I was moving here. And here, the salons do not know what to do with our hair." Mariamu*

What is additionally interesting here is the bodily literacy *Mariamu* acquired in order to braid hair. However, *Mariamu* stated that because she no longer did her daughters' hair, she had forgotten the indigenous skill. The bodily literacy of hair braiding could not be sustained without practice.

Re-enacting Traditional Ceremonies

Once out in the diaspora, a key technique in which IK is nurtured through focus on practices, is the re-enactment of traditional ceremonies. Participants used online searches to source detailed information about how to perform them. However, the internet was largely perceived as lacking in legitimate sources. Consequently, information was sourced from peers, or notable books written about pre-colonial Kenya, the period before the western colonisers' subjugation of indigenous ways of knowing and living. These provided reference points from which traditional ceremonies were re-enacted into the life events of the participants, e.g. birth ceremonies and weddings. As illustrated below:

> *"When he was born, the men did the itega (A traditional ceremony to celebrate the birth of a baby) for him. We got a goat, which is apparently supposed to be cooked by the men only. So my friends and I just sat here while the men were cooking and doing everything. I did not even know that is a traditional thing! Some people had been reading the book Facing Mount Kenya, and that is how they became aware of how things used to be done before... So we re-enacted all that." Dada*

As described by *Shangazi*, the practise of IK, e.g. speaking the Kikuyu language, proved a sense of belonging to the ethnic community. Videos and pictures facilitated the amassing of evidence of belonging as they captured the practise of traditional ceremonies and life events.

DISCUSSION

In the previous section we have reported the motivations and techniques of eight Kenyan diasporans living in Melbourne for sustaining the IK of their homeland. The desire to know one's roots, and to know the real reason behind a traditional practice, performance, saying or ceremony, from a legitimate source, recurred in our data.

This was true for all of our participants, and was reportedly strong in the young of their communities who are interested in interacting with the elderly, in order to learn about day-to-day ways of living. This finding encourages us to take seriously the opportunities for new technologies of exchange between people of different exposure and experience of IK. This first requires attention to the kinds of activities of exchange currently sought and enacted within a cultural diaspora, this being the focus of the present study.

In the present study, then, we have sketched a people-place-practise view of IK, and demonstrated how it can be used as a lens to identify nine specific techniques for sustaining IK in the group of Kenyan diasporans. Most of these techniques involve at least some use of digital technologies of connectivity, though some do not. Collectively they are presented as evidence about the current gaps and opportunities for digital technologies to support the maintenance of IK in diaspora communities. As such, they provide directions for technology innovation, and speak to possible considerations when designing technologies that translate, formulate and support the P-P-P of IK. In this section, we will discuss some of the design considerations that are inspired by the appropriations and non-appropriations that were observed.

It is important to recall that while the appropriations have been framed here through the categories of people, place and practise, no distinct boundaries exist between the three; i.e. practise cannot be separated from people, or people from place. Also, we are working under the premise, admittedly contentious, that while indigenous communities are distinctive, and their uniqueness carries with it unique ways of knowing and living, there are similarities that can be abstracted across indigenous knowledges. The people, place and practise lens is offered as a potential source of commonality that provides a reusable framework to inspire technology designs.

Based on the evidence of this small study, connected technologies were used largely to facilitate searching, and often a kind of crowd sourcing, for resources on IK, through platforms like Whatsapp and Facebook. Principal targets for learning were family and friends in Australia, those in Kenya and other countries in the diaspora. Similar to [29], we observed that "communication technologies are also information technologies". Meaning that the technologies used for communication with other people e.g. Whatsapp and Facebook, were seen as sources of IK; they facilitated communication with people who might be bearers of knowledge, or links to those who are. Phone calls were a popular means of communication when seeking IK from those in Kenya. Youtube proved a popular channel for keeping up with Kenyan news, music, dances, comedy, and learning Kiswahili. Video recording and live streams were used to record or participate in traditional ceremonies performed during life events like birth and marriage. News collection sites were popular, in particular http://www.kenyamoja.com/, due to its curation of all major television channels, radio stations, and entertainment blogs in Kenya. Technology also allowed for the live streaming of life events, such as weddings, where activities could be carried out with remotely located participants at the same time. Remote observers used props available to them to participate in the ceremony they were viewing via the live stream. Two-way communication was facilitated by phone messaging, which was preferred because it did not disrupt the activities in the observed place, and also supported a one-to-one intimacy. This viewing, augmented with two-way communication and synchronous participation of live activities, gave the remote participant a feeling of "actually being there".

Applying a P-P-P lens to these observations, revealed gaps where current technologies in use were not able to support the needs of the participants for IK. Perhaps one of the biggest gaps can be summarised through the continued desire and reliance on physical meetings where it might be thought that digital exchange could contribute. Physical meetings, that underpinned techniques like apprenticeships and pre-learning, allowed learners to acquire knowledge found in taste, observation, feel and located interactions. Indigenous community members not only communicate knowledge verbally, but also highly utilise the non-verbal sounds, ululations, silences, changes in tone and resonance, mime, and body and gestural movements that constitute their languages [6, 26]. We observed that the cooking of intricate dishes and activities like hair dressing, involved knowledge in the form of feel of the food or hair, smell of the food, rhythm of hand movements when plaiting hair, change of texture of the food while it is cooking etc. Additionally, *Baraka* and *Shangazi* attempted to use phone calls to give instructions on how to prepare traditional foods. However, our participants expressed difficulty in translating bodily literacies into a form that is afforded by phone calls and videos. By extension, we can infer that common knowledge sharing tools, e.g. YouTube and phone calls, unsatisfactorily translate the gamut of literacies indigenous communities use to share and nurture knowledge. These observations and the more general inference resonate with other research. As noted by [3], the inability of videos to capture the relationships with the place and artefacts, hidden or revealed in sound, movement or feeling hinders valuable expression of IK practices. This motivates a need to understand how audio-visual technology design can transport, engage and enliven interactions and artefacts, in everyday activities like cooking, and when the parties concerned are dispersed, i.e. between the diaspora and *in situ*. In another study[5], a traditional healer critiqued the use of video cameras when teaching about local herbs. The healer preferred to teach by walking with the student and participating in particular activities, tasks which he found cumbersome if done with a video camera.

The flying in of experts, planned physical encounters and the creation of special meeting spaces also speaks to the need to cater the participants' varied levels of exposure and experience of IK. For example, *Mariamu* was involved in a dowry ceremony for her niece. This involved her flying from Melbourne to Adelaide three times to meet the families of her niece's fiancé. *Mariamu* had previously understood the dowry ceremony to be about selling the bride. However, by taking part in the ceremony and having to physically meet the groom's family, she learnt otherwise. Traditionally, the groom was not allowed to pay the full price at once, and was meant to do so bit by bit every year to ensure the families of the couple met regularly, and maintained a relationship throughout the marriage of their children. Participation in the dowry ceremony further prompted *Mariamu* to travel to her home in rural Kenya, so that she could understand the dowry ceremony from the perspective of "the old men of the village". This presents an interesting challenge as it pushes for a consideration of not only the situatedness of life events, but the need for participants to customise or build their own memories, learnings and experiences of such events. IK life events, while largely communal, are at the same time an assembly of defined roles, persons and actions, each with a need for a personalised experience of the whole. The balance between mediating IK practices for the whole and at the same time for the one presents a significant consideration for IK design.

CONCLUSION

Through a people-place-practise lens, we have identified nine techniques to sustain IK used by a group of Kenyan diasporans living in Melbourne. We contend that an the evidence of how existing technologies are appropriated, or not appropriated, within these nine techniques can inform the design of new technologies for IK exchange (as discussed in [23]). By seeking to identify areas where current arrangements and technologies do not suffice in sustaining IK, our work invites the design of new technologies that can fill these gaps. This represents a move away from analysing the surface use or non-use of technologies from a Euro-American perspective, to understanding and designing for the less visible, but more significant, influence of people, place and practise. Moreover, examining the practise of IK among transnationals in the diaspora is a new space for technology research and design. The indigenous transnational user offers unique requirements, including the need to cater to multiple connectedness, i.e. to places of origin and places of migration; technologies that can be dissimilar due to diverse users e.g. *in situ* elders and urban diaspora, and yet fulfil the same desire to cultivate IK; and technologies that can transport, personalise and replicate people, place and practise such that IK is cultivated in remote locations.

In conclusion, though focusing only on a small group of Kenyan women, our study offers a window into understanding the challenges faced by other globally dispersed cultural groups who similarly desire to develop IK in their places of migration. We hope that this paper will motivate more research in the areas of IK and transnational HCI, and that more nuanced technologies may be designed to cultivate and share IK.

ACKNOWLEDGMENTS

We thank all the participants that took part in this study.

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