

## **LOCALLY SITUATED DIGITAL REPRESENTATION OF INDIGENOUS KNOWLEDGE**

*Co-constructing a new digital reality in rural Africa*

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**Abstract.** Digital re-presentation of indigenous knowledge remains an absurdity as long as we fail to deconstruct the prevalent design paradigm and techniques continuously re-framing technology within a western epistemology. This paper discusses key challenges in attempts of co-constructing a digital representation based on experiences from a longitudinal community-centred research project in rural Africa. In a quest to shape design from a locally situated viewpoint, we co-design a 3D visualization of an African village with its inhabitants. Prior invisible local perspectives, as well as dominant designer's views are brought to light within the design interactions. A new digital reality is created at the periphery of the situated knowledge through continuous negotiations and joint meaning making.

### **1. Introduction**

The digitalisation of indigenous knowledge (IK) is pursued on all continents by numerous agencies, yet with different motives and sensitivity toward tensions arising in representing indigenous knowledge digitally and the factors that contribute to these tensions. With a critical view on technology design's promoted western epistemological and methodological perspective we identify key challenges of establishing a locally situated indigenous design paradigm in which appropriate technology can be created. In the following section we explore the Southern African situation further to contextualise our own attempts of digitally representing African indigenous knowledge as part of a long term collaborative research project. We intend to adjust our perspective from "somewhere else" to a local perspective through an on-going dialogue around technology, in order to design a representation which is meaningful to the community.

### POSITIONING (AFRICAN) INDIGENOUS KNOWLEDGE

IK has been receiving diverse kinds of attention from different viewpoints over the last decades. In development thinking, the dominant standpoint has been a reduction of IK to practical techniques and artefacts (van der Velden, 2010). Globalisation, as manifested in formal education, technology design, development of diverse sectors and intellectual discourses has endorsed a dominant 'western scientific' view of the world sidelining IK. International organizations such as World Bank, United Nations Development, the World Intellectual Property Organization deploy worldwide legal standards and rules without engaging into ontologies underlying IK (van der Velden, 2010). This has led to obvious incompatibilities with locally appropriate formulations of policies, such as the commodification of IK, ownership and benefit sharing models as has been recently discussed at a SADC conference<sup>1</sup>. Meanwhile African intellectuals and governments have re-discovered the value of their own local and traditional valid knowledge and are now actively challenging established paradigms and processes. Southern African governments have requested for an integration of African IK into formal education, while in other sectors such as health and agriculture we observe an increased informal dual system with the application of both knowledge systems. While governments and NGO's are committed to preserve, document, and disseminate IK to the benefit of local people, they are largely unaware of the hidden power of data structures and information architectures in the technologies chosen to support those endeavours.

### MISREPRESENTATIONS THROUGH ABSTRACTIONS

African IK fundamentally differs from the knowledge system which has governed mainstream technology development. Generally IK has been described as dynamic and adaptive, heterogeneous and distributed, social and collective, and experimental (van der Velden, 2010). While some of those features can be supported by current technology, we observe that catering for fundamental different values requires a major shift in design thinking. Most importantly, we need to deconstruct the conceptual framework under which we repeatedly 'dislocate' Africans and their knowledge system by maintaining a Western reference point before launching into design activities. Asante (1990) institutes the Afrocentric paradigm as the building block of Africa's own intellectual movement propagating a conceptualization from an African view point. "Such a position is critical in Africa as researchers may misrepresent indigenous cultural practices and thus continue to perpetuate myths about the indigenous African culture" (Mkabela, 2005). Adopting an afro-centric method in design suggests cultural, social and intellectual immersion as opposed to scientific distance (Mkabela, 2005). While, the "scientification" of IK strips away the detailed, contextual, applied aspects of knowledge that might be critical" (van der Velden, 2010), digital representation thereof further enforces loss of essentials. In our design endeavours in rural Africa, we are continuously reminded of an African worldview deeply rooted in a consciousness of connectedness with an overarching holistic approach, and viewed in contrast to this the

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<sup>1</sup> Fourth Southern African Development Community's (SADC) Indigenous Knowledge Systems Workshop, Windhoek, Namibia 18-20 October 2011

limitations of our own technological thinking stands out. This has become more evident than ever in our long-term involvement with one of the rural traditional healers in eastern Namibia. In an attempt to minimize our own judgement of priorities and control within recordings of oral and performed narratives, we provided the traditional healer and alternatively his apprentice with a flip-camera to capture what he deemed to be relevant. However we observed that the traditional healer himself is as much part of the narration as the plants he could film, touch and administer. Thus we realized that recordings would suffer a major loss of information burdening the traditional healer with recording and thereby missing his very own body language as part of the narrative (Bidwell et al., 2011). The healer suggested being equipped with a tripod and a remote control so that he could capture himself in action. In a latter trial of a story-based multimedia tool in which the healer re-constructed a previous real-life healing process, during which audio, video and still pictures were taken by a number of observers, we noticed that he only selected multimedia files in which he was present. Many western accounts of traditional healing have been reduced to knowledge on plant extractions which is even undergoing scientific validation processes. The recognition of a holistic and spiritual view expressed in the relationship of the healer, the plant, the patient and the environment has been deliberately devalued and ignored. In the process of this abstraction and modelling it is not surprising in which way current databases and repositories of so called traditional medicine have erased fundamental links and views of the originating knowledge system. The knowledge is then represented episodically rather than preserving its semantic and contextual relevance.

Cultural logics and literacies are embedded in the strategies privileged by technology design, thereby replicating ways to organize, make sense of, and communicate about the world (Dourish and Bell, 2011). "Not only does the information architecture reflect a particular politics of knowledge but it also somehow enacts it." (Christie, 2004). As current technology design is deeply rooted in a Western epistemology, it is intrinsically invested with a partiality which privileges certain assumptions, values, definitions, techniques, representation, models, and available technology devices. It becomes questionable, to what extend external (to the communities) IK repositories are able to preserve the integrity of the IK and what their role is in every day life of marginalised communities in view of the fact they have limited access to these repositories, and of the fact that the traditional IK systems are still the most relevant and most immediate for these communities. Can technology preserve the dynamic nature and social-embeddedness of IK? Can the inherent and deep human values and cultural philosophies embedded into the stories and traditions be preserved in the digital IK repositories?

#### EMBRACING INDIGENOUS KNOWLEDGE INTO DESIGN PARADIGMS

Over the last three years we have established profound collaborative relations with rural African community members in our active pursuit to embrace IK systems into the design of a community-centred IK management system. Based on the recognition of an erroneous and widely claimed universality of technology design principles, we attempt to contemplate processes and design decisions through "the eyes of the locals", thereby opening new design spaces and a common platform for dialogue. We accept key values

embedded in African IK, such as the interconnectedness of all, the holistic view including spirituality, and oral and performed transmission (Bidwell et. al. 2010). The local way of life and conceptualization of the world determines our design processes and decisions, in which our roles as designers are continuously re-defined and where at times we find ourselves “being participated” rather than facilitating design activities (Winschiers-Theophilus et. al 2010) while oscillating towards a common understanding of an appropriate digital representation of IK.

The purpose of the IK management system is to create a digital platform where the village elders can represent and share their knowledge in a meaningful way to them and the youth, who have migrated to urban areas. In Namibia, as in many other parts of the world, the younger generations have migrated to cities thereby interrupting the traditional generational knowledge transfer. In a previous phase of the project, co-researchers as well as community members have captured rich multimedia recordings of indigenous practices, which they considered to be relevant. Attempts of mapping local communication and thought patterns have guided design sessions and past prototype implementations and evaluations (Kapuire et al. 2010). A major breakthrough in terms of community members’ engagement has been achieved with the prototype in which the videos were embedded into graphical scenarios featuring within a 3D representation of the communities’ own village (see figure 1) (Rodil et al. 2011). While the idea of developing a shared 3D platform, bridging a generational, conceptual and technical gap between the village elders and the urban youth has been adopted, a number of fundamental questions arose around the validity of common principles of perception, (3D) representation and recognition in their application to this rural African village. Evers and Hinds (2010) have previously challenged the universality of design rules which were erroneously based on the assumption of common human socio-psychological functioning inconsiderate of cultural variances. Thus our design thinking had to be continuously questioned during the co-construction of the 3D representation. As we encountered the unexpected we retrospectively deconstructed our own assumptions and looked for supporting literature. In the scarcity of the latter we conducted our own intermediate studies to verify specific hypotheses. Although our examples and experiences centre on visual representations, the reader can derive guidance for constructing any representation considering culturally distinct worldviews.

## **2. Located Representation**

### DESIGN FROM SOMEWHERE ELSE

Our discussion is based on the understanding that any representation, be it digital or other, is an actively constructed account of a perceived reality from a specific viewpoint. We need to be conscious of the fact that our conceptualisation and “our vision of the world is a vision from somewhere – that it is inextricably based in an embodied, and therefore partial perspective – which makes us personally responsible for it” (Suchman, 2002). While each individual construct their own worldview, through conscious explorations of viewpoints or less cognizant acculturation processes, we observe commonalities of perceptions within societies and subsets sometimes expressed

in terms such as “feminist perspectives” or “African perspectives”. Thus we can assume that a close to common perspective of the world can be obtained through socialization processes over an extended period of time. In the context of our design project in the African rural village, we have observed very distinct perspectives between the community members and us the designers “from outside”. Those differences appear in discussions about the world or representations of it, such as our chosen depictions within the first visual prototype demonstrated in the village. Community members pointed out mis-representations of scenarios in which body postures and gestures were simply “wrong”, or the walking style and trajectory of the cattle was inappropriate and specific trees were misplaced, etc, (Rodil et al. 2011). Thus we need to ask ourselves “whose images are seen, presented and promoted and whose aren’t?” (CATAC 2012 call for papers) or rather “how can designers from “somewhere else” adjust their perspective to the one of the community if the representation constructed aims to be meaningful to the community?”

Having acknowledged the differences in perception we now consider the second part of the design process, the “construction of a representation” which in itself is also highly dependable on the designers, their skills, their intentions, as well as active interpretation of the perceived reality and user needs. Thus the question of the abilities, the role and interactions of an ‘outsider’ in the design of a system supposed to represent a local perspective arises. While each participating member of the design team plays their role in colouring the design outcome, often the designer controls the process (Winschiers-Theophilus, 2009). Depending on the methods selected, individuals, community members and designers’ voices and views influence the final outcome. Thus theoretically, the most appropriate technological representation of the reality of an indigenous community would be if led by the community members themselves assuming necessary technical skills within the community or co-opted with the additional premise of the pre-designed technology already flavoured with its origin of context. It is important to note that any representation with new media and technology is a construction of a “new reality” by the people involved in the design, the technology and the usage context.

#### DESIGNERS’ INTENSIONS AND INTERPRETATIONS

At this point in time, unfortunately very few indigenous people have actively engaged in representing their worldview digitally - at least in Southern Africa. In most instances, designers ‘from somewhere else’ collaborate with indigenous people in constructing a new digital reality. But conscious of the designer’s influence and possible dominance on the design outcome, we ask ourselves, if activists or designers “are using new media to represent realities of, say (oppressed) indigenous people in a given country, is this better than no visibility at all, even if the people in question do not have access or skills to present themselves as subjects?” (Catac 2012 call for papers) Directly asked for their opinions in this regard, our village elders and other community members expressed gratitude for having been engaged in this project, pride in our acknowledgement of their wisdom and IK while at the same time hope that their voices would be heard by government and other agencies to facilitate their desired developments. Moreover, urban migration, formal education and other global developments have undermined and

disrupted the traditional oral transfer of still valid and applicable IK from the wise elders to the next generation. Thus we find many initiatives around the world, where idealistic designers support the digitalisation of IK for the purpose of preservation, documentation, and many other genuine reasons. Yet no matter how noble the goal, the questions remains whether the knowledge is “truthfully” represented and whether it will adequately communicate the ideas and values of the indigenous cultures (Christie, van der Velden).

Beside the many classical approaches of videos and adapted databases, we witnessed a presentation of an artful story interpretation by Heyes (2011). Based on the notion that stories can be meaningfully represented in built form, Heyes, a landscape architect, intends to revive and celebrate ‘real’ Inuit stories still circulating in the Kangiqsualujjuaq (Nunavik territory) community through the design of a virtual storytelling space. Numerous visits over many years, listening to stories, observing local artists, as well as discussions and co-design sessions with the Inuit elders, inspired Heyes’ artful creation, which captures the human, spiritual, and natural elements of the Arctic landscape and seascape thereby enabling the next generation of Inuits and others to experience, feel and re-interpret Inuit legends. Although the artefact clearly demonstrates Heyes’ very own interpretation of Inuit stories, it has to be seen as yet another example of a synergized new representation, which is nothing like the one in the past, yet promoting the same intention of transferring timeless stories from one generation to the next, re-shaped by its tellers or designers. As knowledge and rituals, themselves are continuously adapted to new circumstances, technology is yet just another medium contributing to the transformation of representation. Despite a heated debate during the conference on the validity of a new interpretation from ‘elsewhere’ we consider a representation to be “acceptable” if the community in question recognises it to be appropriate and to be reflecting their fundamental human values and the essence of being. As more and more technology design collaborations with the involvement of indigenous people emerge, existing paradigms will be questioned and pave the way for further initiatives. However the validity of any externalized representation and if and how it can be validated within the indigenous cultures remains a challenge.

#### TOWARDS AN INDIGENOUS PERSPECTIVE

Various Indigenous communities have appropriated audio-visual media to convey their knowledge to wider audiences (Bidwell et al. 2008). However, reconciling media with a non-Western episteme must account for the situated nature of information transformation as communities appropriate media. Knowledge, narrative and representation flux and entwine in an on-going dynamic process. People create meanings with, and about, new representations continuous with their original concepts, values and beliefs and contemporary culture (Bidwell et al., 2011).

Martinez (2011) further emphasizes that although “colonization is endemic to the use of electronic technology [...] cultural and rhetorical expression of digital media is necessary for indigenous peoples to exercise their sovereignty in a digital age”. Martinez, with Northern New Mexican Mestizo roots, embraces “the importance for indigenous peoples to consider culturally responsive uses of digital media as an emergent aspect of indigenous culture” in his own design endeavours. In his co-

intentional collaboration with indigenous people, Martinez creates indigenous media, which facilitates epistemologically situated learning experiences, such as the digital Ayayote rattle.

In our long term collaborative development of an IK management system, we chose to closely work with a co-researcher who finds himself at the intersection of the two worlds, originating from the village yet having undergone a full information technology education. However on the one hand he struggles to merge the two contradictory conceptualizations of the world, on the other hand he is unable to reflect on his own cultural immersion. Thus his role becomes the one of a facilitator and interpreter at the 'contact zone' (Van der Velden, 2010) with the designers 'from elsewhere' and the community members. Although genuinely trying to reconstruct the world through the eyes of the local community members we have really drawn a new joint picture of the local reality. Not only have we transformed representations through many verbal translations but also visual translations and thereby reconstructed a new meaning of local stories. Having accepted the unavoidable fact of metamorphosis through technology design we recognize the nature of co-construction a designer-community branded artefact which immanently redefines meanings. We can only strive towards refining our co-creation and participatory methods to minimize the footprints of our external techno-centric culture. While in the long run we strive for an Afro-centric design, which promotes cognitive self-determination of indigenous peoples in regard to further technology development and research in IK systems.

### **3. Co-design of a Visual Representation**

In the following section we will share project specific experiences and realizations we had along the co-construction of a 3D representation of our pilot village in Eastern Namibia in our attempt to locally situate the design perspective. The process is based on a number of prolonged stays in the rural community for up to a week at the time; each trip being a combination of design sessions, technology probe evaluations and more controlled experiments.

#### **AWAKENING – COGNIZANCE OF DIFFERENCES**

Considering a prevalent oral and performance based knowledge creation and transfer process in rural Southern Africa, we renounced from textual dominated technologies and launched into the exploration of visual and location based representations as a virtual context for digitalized IK. Prior studies of our collaborative rural community have established the significance of place, location, and navigation interweaved with social activities (Bidwell et al. 2011). This community has demonstrated established rituals observed across other rural Herero (ethnic group) communities in the region, such as placement of the holy fire in relation to the house and the kraal (fenced enclosure), appropriate location for slaughtering of goats, cooking of white versus red meat, etc. Thus we embarked on a first implementation of a 3D visualization of the village to embed pre-recorded videos. The graphic designer from far away (Scandinavia) launched into an approximation of building graphical elements based on

photos and videos, such as houses, fire places, goat and cow kraals as well as representations of scenarios such as a group of people healing a cow, for which a community recorded video could be displayed (Rodil et al. 2011). The relative placement was informed by the co-researcher originating from the village. However the first demonstration of the prototype and feedback session (see Figure 1) with the community unveiled a number of unexpected results. While on the one hand the villagers were for the first time, after the start of the project, thoroughly criticizing details and discussing further design ideas, we also observed that although the villagers could recognize the individual elements on the screen they did not realize that it was supposed to be a representation of their very own surroundings. While we the outsiders could immediately relate to the representation, the villagers themselves would only identify specific known indicators after multiple promptings.



*Figure 1.* Left: Prototype screenshot with embedded video Right: Villagers responding to the 3D representation.

An extensive discussion within our research group started on the principles of 3D representation and recognition. Different questions arose such as how to represent the village and the individual homesteads in particular to ensure easy and immediate recognition. Did we depict the wrong elements or did we mis-arrange them? Did we mis-represent them? Did we choose the wrong viewpoints? A number of different opinions and hypotheses emerged in our design team, yet all coloured by our western scientific mindsets. We decided to explore two main aspects further in the next phase. Firstly, to explore from a larger number of community members how they would visually represent their immediate environment and whether they have a shared understanding of visual representations. Secondly, we wanted to investigate which factors hamper or enhance recognition in 3D, e.g. should we strive for more “realistic” or abstract representations, does colour or the angle of view matter?

#### A LOCAL REPRESENTATION

In the first prototype the 3D graphics designer selected which elements to include in the model and which not. His major focus was on man-made objects, such as houses, fire places, fences, water pump objects which his eyes are trained for to differentiate easily, unlike bushes and trees. Yet each person or group may ‘narrate’ a place differently: emphasizing particular features, events or characters, and arranging relationships between these in different temporal or causal orders. Often the meaning of a place is

contested locally (Byrne 2008); Thus unsure about the relevance of the chosen elements we decided to further explore the villagers' suggestion on representations.

#### *Methodological approach*

During a four day stay in the village we ran individual drawing sessions with 21 community members of different ages, asking to draw their own homestead, once from the front and once from the top (through the 'eyes of a bird') (Jensen et al. 2012). The main objective was to investigate which elements they would draw (see Figure 2). Secondly we gave them a generic shape of an animal which they were requested to turn into a cow and another into a goat. Here we wanted to see the details the villagers considered to be of relevance. In yet another session we had a group of elders and later youth play the game of Pictionary, where terms were chosen from local narrations. The idea was to investigate whether there would be a shared representation which would lead to easy and fast recognition.



*Figure 2.* Leftmost: Elder drawing. Left: Young girl drawing. Right: Elders playing Pictionary. Rightmost: Young girl drawing while playing Pictionary.

On the next field trip we brought an Android tablet with a prototype implementation of a HomeSteadCreator. By touch interaction the user selects objects and drags them into place on the 'empty canvas', and through previously established camera perspectives inspect the creation. A wide range of modelled objects, such as houses, animals, trees, fences and pots, informed by prior villagers' drawings, could be selected by the user (see Figure 3). The short term goal was to investigate and how the villagers would represent their homesteads, and how these would correlate with previous drawings. A long term goal is to design a tool, which enables the villagers to recreate the context for recorded IK as shown on Figure 1. Informed by villagers' drawings and feedback on prototypes, we hope to gradually build a creative space allowing for in-situ design of community determined graphical representation – unhinged from our design decisions.

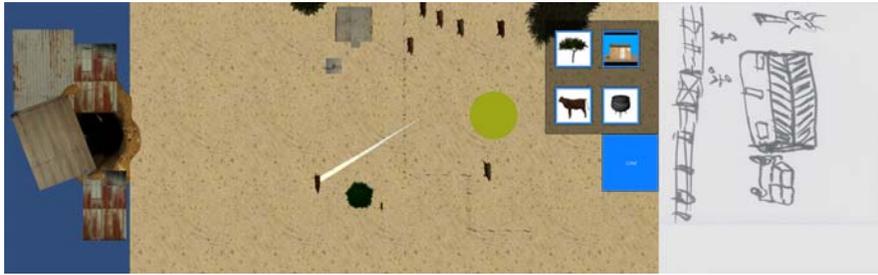


Figure 3. Left: Screenshot of the HomeSteadCreator Right: An example of an individual drawing made by a villager depicting objects important to the homestead.

#### *What matters?*

We analysed the drawings for the occurrence of different objects, sequence of which objects were drawn and the chosen perspectives. We observed a gender bias in terms of the majority of male participants drawing fences and cattle, while the female participants drew cooking utensils. The houses were drawn very similarly across all participants. Most drawings had a tree next to their house as well as the fire place in front, just like in reality. Neither objects' size nor distance relations correlated with reality. In the goat and cow drawings great similarities were found across the participants' drawings in the details, which can directly inform further modeling of those animals in 3D. In the Pictionary case we observed wide recognition of drawn scenarios as well as similarities across the groups in terms of depicting, which suggests that there is a shared agreement on recognizable representations. Most importantly the drawings facilitated discussions about the representation of objects in the environment as well as possible representations of user interface objects.

#### RECOGNITION

Puzzled about the low recognition of the representation of the villagers familiar surrounding we wanted to investigate specific features which we assumed could have hampered recognition.

#### *The perspective*

Previous findings in the project questioned the perspective users should have within the representation. This manifests itself through the choice of camera angle in the 3D visualization. To further explore the effect on recognition, we modified the first prototype to allow for changing the perspective to three different camera angle views. In the evaluation session users expressed a strong rejection towards a top down view, confirming findings in the literature (Mangan, 1978), yet they expressed almost equal appreciation for the front or tilted view (35 degrees) (Jensen et al. 2012).

Previous evaluation sessions were conducted in smaller group settings thereby obtaining a consensual community feedback. However in this instance we measured 25 distinct individual's recognition rates of graphical representations of houses, varying the perspective and the colouring. For this purpose, we developed a prototype on a

tablet, where a photograph taken of a house in this specific village was displayed in the top-left corner. The remainder of the screen featured 9 different modelled houses, of which the user was asked to select the one being similar to the one on the photograph (see Figure 4). The test series consisted of five photographs with four different representation types, e.g. front, tilted, coloured and black and white of the same houses. While the colouring did not substantially influence recognition, the recognition rate varied from 80% in front view to 65% in tilted view. The results re-established our previous findings regarding preferences of and recognition in different perspectives. Once more we realise that we cannot assume that common design guidelines are based on universal human functioning but that we need to explore cultural variations before taking final design decisions. In the absence of reliable literature resources we need to engage in basic experiments confirming the appropriateness of our design. We further believe that many “odds” discovered in the high-fidelity prototype evaluations could not always have been anticipated and therefore following an oscillation design process seems adequate.

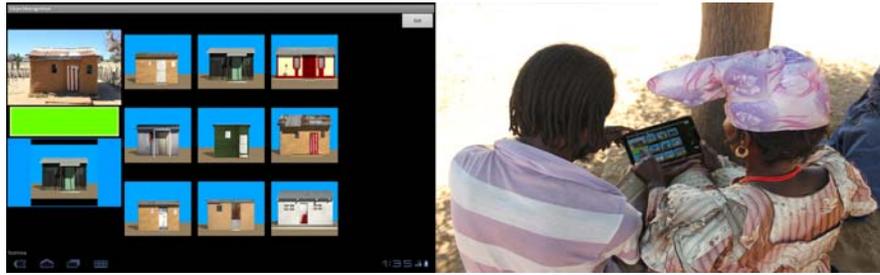


Figure 4. Left: House recognition tool. Right: A Herero woman is finding the match.

#### *The standpoint/viewpoint matters*

A South African skilled 3D graphic student was contracted to model a number of trees from the village as depicted on photos taken during a previous trip. All modelled trees were recognized by a local colleague from the agriculture department. Yet the villagers all agreed that those trees are nowhere to be found in their own surroundings. Once more although they looked perfectly comparable to the real trees to us, something about the representation was “wrong” that made them unrecognisable. Again a number of speculations arise, which we will explore in a successive phase of this project. A possible explanation could be that the photo was taken from a standpoint where villagers would usually not look at the tree. Another possibility are specific details on local trees, colour, shape, such as one branch longer, certain cut, etc, which we have not realized. In this case we suggest an ‘extreme’ design approach where the villager looks over the shoulders of the designer indicating necessary changes until community recognition is guaranteed.

#### *How realistic?*

The designer originally defended the position that everybody “sees the same” and therefore recognition is only about designing the representation as “realistic” as

possible. Yet we well know that perception of reality differs from person to person but also across cultural lenses which determines the foci. Thus equally in a visual representation as designed by an external to the community we need to ask ourselves who's reality is represented and how do we facilitate for the designer to "see through the eyes of the others" in order to represent the local essentials. Can 3D graphic design be based on photos and be as realistic as possible lead to higher recognition? The problems experienced in the evaluations cycles were that the more detailed the more peculiar the villagers become. Much emphasis was put by the designer on modelling the houses as "realistically" as possible. Numerous discussions on which detail he considers to be essential for recognition would not necessarily be the details the house owner or neighbours would consider essential. In one instance the owner of the modeled house said that his roof sheet is not placed in the modelled way, while the photo taken by the much taller designer clearly does depict this sheet placed as modeled. But of course the house owner never saw his house from this standpoint. Also between two trips in which the houses were modeled, the one got painted thus again the owner said the depicted house is not his house. Once more we realise that no matter how close we approximate the representation to our perspective of the reality, the perceived reality of the local community is based on a different frame of mind about what is important and how things should look; so any 'realistic' representation remains a partial and biased view and only holds 'true' in the eye of the designer.

#### MAKING THE INVISIBLE VISIBLE

The technology probes and various system prototypes together with the drawing sessions have proven to be immensely valuable as "tools" around which to facilitate interaction with the local community members. It has helped making the invisible visible through a process of interaction and dialogues around the visualizations. Common methods, such as contextual inquiry, interviews, and standard prototype evaluations only cannot reveal the unexpected facts. The issue at it's core is: How can you see and discover what you are not looking for, and how to ask the right questions which will shed light on the thought processes and perceptions that are so natural to people, that it will never occur to them to explain it to anybody, assuming that other people must surely see it the same way? As technology designers, we are ourselves often the culprits of such assumptions.

We want to stress that our findings are not merely mappings of simple objects, details and their relative importance but fundamental and holistic ways of thinking about the local environment and what "makes sense" to the people inhabiting it. An illustrative example can be drawn from the aforementioned "HomeSteadCeator" prototype (as shown in figure 3), which included a way for the users to get rid of any object that they had mistakenly put into the virtual homestead. In an effort to "contextualize" the design of the interface, a garbage dump site was added to the one side of the virtual homestead being a near photorealistic representation of an existing garbage dump in the village - the rationale being that the villagers would not understand a "Western" metaphor like the trashcan used in many operating systems. While the recognition of the dump site and it's intended purpose was almost instant, the resulting reactions were highly surprising: the villagers was disturbed and outspokenly

disapproving the concept, saying that they would never even consider to throw something away, everything can be reused; and the mere thought of throwing a cow or a chicken (even virtual) into an (equally virtual) garbage pit was highly abhorrent to them.

Only in the interaction with the representation did the discussion around a metaphorical “delete” occur which otherwise would have been assumed to be a universal function of nearly any computerised application. Thus we argue that our continuous introductions of technology probes and discussions around them with the community facilitate a mutual understanding of each others knowledge systems thereby informing the design at the 'contact zone' and revealing what would have remained invisible.

#### **4. Conclusion**

##### LOOKING BACK

While numerous initiatives aim to enable diverse, and often remote, communities to share their wisdom and practical know-how with conventional digital technologies; however, often, these endeavours overlook their mis-match with the very systems that indigenous people use in daily life to organize and make sense of the world. To design digital infrastructures for currently unserved knowledge systems we must account for the transformations that occur as technology interacts with the ways of knowing, doing and being that constitute IK systems. The entanglement of knowledge, worldviews, representation and recognition directly affects technology design. We need to ensure that we strive towards a common view of the world and agreed upon shared representations to ensure recognition and acceptance by the target community. Cognitive self-determination of Indigenous Peoples must not be compromised within any further technology development and research in this area. However a critical observation of the design interactions and dialogues illuminates the initial dominance of the designer's perspective which can only be adjusted to a local perspective over continuous interactions with the indigenous people involved in the co-design process. The whole process is a dynamic and organic construct full of pitfalls for we shall make no claims to have uncovered all of these nor shall we pretend to know the right methods to use. We do, however, in the context of the reported studies, believe that we have learned lessons that can be generalized across design of digital representations of IK systems. Thus even in the case of designing a non-visual system, visualisation can be used to elaborate differences and oscillate toward a common meaning within the design process.

##### FINALE

Having been involved over a long time period in co-designing processes, we have realised our own limitations in figuring out how ‘the others’ perceive the world and anticipate a respective representation. We come to understand that the technological artefacts cannot be based on our preconceived blueprints and guidelines, but have to evolve as part of a co-owned process and continuous negotiation between the external holders of technology knowledge and the internal holders of IK. We do not believe that

there are a determined set of universal methods for gaining access to the mind's eye of any culture, but from our experiences we have discovered that over multiple interactions around the technology we together can shape the representation towards a meaningful and recognisable abstraction for all parties involved. In the absence of valid guidelines and research results we pioneer a development process oscillating between high-fidelity prototype evaluations and basic experiments, to reveal the invisible views of the indigenous people we design with, attempting to approximate a representation through their eyes.

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### References

- Asante, M. (1990). *Afrocentricity and Knowledge*, Trenton: The African World Press
- Bidwell, N. J., Standley, P., George, T., & Steffensen, V. (2008). The Landscape's Apprentice: Lessons for Design from Grounding Documentary, *Proc. Designing Interactive Systems (DIS)*, 271-280 ACM Pr.
- Bidwell, N. J., Winschiers-Theophilus, H., Koch-Kapuire, G., & Chivuno-Kuria, S. (2011). Situated Interactions Between Audiovisual Media and African Herbal Lore. *Personal and Ubiquitous Computing*. 15, 609-627.
- Bidwell, N. J., & Winschiers-Theophilus, H. (2012). Extending Connections Between Land and People Digitally: Designing with Rural Herero Communities in Namibia, In Giaccardi, E. (Ed). *Heritage and Social Media: Understanding and Experiencing Heritage in a Participatory Culture*. Taylor & Francis/Routledge
- Byrne, D. (2008). Heritage as social action, In G. Fairclough, R. Harrison, J.H. Jameson, & J. Schofield (eds.). *The Heritage Reader* (pp.149-173). London & New York: Routledge.
- Christie, M. (2004). Computer Databases and Aboriginal Knowledge. *Learning Communities: International Journal of Learning in Social Contexts*. 1, 4-12.
- Evers, V., & Hinds, P. (2010). The Truth about Universal Design: How knowledge on basic human functioning, used to inform design, differs across cultures. In *Proceedings of the ninth international workshop on Internationalization of Products and Systems: Building Global Design Communities* (pp. 33-42). London, UK.
- Heyes, S. (2011). Recovering and Celebrating Inuit Knowledge through Design: The Making of a Virtual Storytelling Space. In Bidwell, N. J. & Winschiers-Theophilus, H. (Eds), *Proceedings of IKTC2011: Embracing Indigenous Knowledge Systems in a New Technology Design Paradigm*. (pp. 62-71). ISBN: 978-99945-72-37-3 Indigenous Knowledge Technology Conference 2011, Namibia
- Jensen, K., Winschiers-Theophilus, H., Rodil, K., Winschiers-Goagoses, N., Kapuire, G., & Kamukandjandje, R. (2012). Putting it in Perspective: Designing a 3D Visualization to contextualize Indigenous Knowledge in Rural Namibia. In *Proceedings of DIS*.
- Kapuire, G., Winschiers-Theophilus, H., ChivunoKuria, S., Bidwell, N. J., & Blake, B. (2010). A revolution in ICT, the last hope for African Rural Communities' technology appropriation. In *Proc. IDIA (4th IDIA Conference)*.

- Mangan, J. (1978). Cultural conventions of pictorial representation: Iconic literacy and education. *Educational Communication and Technology*, 26(3), 245-267.
- Martinez, C. (2011). Digital Ayayote Rattle: The Design of a Portable Low-Cost Digital Media System for a Mediated Xican Indio Resolana. In Nicola J Bidwell & Heike Winschiers-Theophilus (Eds), *Proceedings of IKTC2011: Embracing Indigenous Knowledge Systems in a New Technology Design Paradigm*. (pp.88-97). ISBN: 978-99945-72-37-3 Indigenous Knowledge Technology Conference 2011, Namibia
- Mkabela, Q. (2005). Using the Afro centric method in researching indigenous African culture. *The Qualitative Report*, 10(1), 178-189. Retrieved 08.01.2012, from <http://www.nova.edu/ssss/QR/QR10-1/mkabela.pdf>.
- Rodil, K., Winschiers-Theophilus, H., Bidwell, N. J., Eskildsen, S., Rehm, M. & Kapuire, G. (2011). A New Visualization Approach to Re-Contextualize Indigenous Knowledge in Rural Africa. In *Proc. Interact 2011*. vol. 6947 of Lecture Notes in Computer Science, chap. 23 (pp. 297-314). Springer Berlin / Heidelberg.
- Suchman, L. (2002). Located Accountabilities in Technology Production. *Scandinavian Journal of Information Systems*. 14(2), 91-105.
- Van der Velden, M. (2010). Design for the Contact Zone. In *Proceedings of the Cultural Attitudes towards Technology and Communication Conference 2010*.
- Winschiers-Theophilus, H. (2009). The Art of Cross-Cultural Design for Usability. In C. Stephanidis (ed.), *Universal Access in Human-Computer Interaction. Addressing Diversity*, vol. 5614 of *Lecture Notes in Computer Science*, (pp. 665-671). Springer Berlin / Heidelberg.
- Winschiers-Theophilus, H., Bidwell, N., Blake, E., Chivuno-Kuria, S., & Kapuire, G. (2010). Being Participated: A Community Approach. In *Proceedings of the Participatory Design Conference 2010. Participation: the Challenge* (pp.1-10). Sydney, Australia: ACM.