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Technology design with indigenous and marginalised communities
– A pragmatic approach to knowledge and alternative future creation-

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Abstract

At the frontier of disciplines and methodologies, scrutinised through multiple theoretical lenses, community technology design research provides new empirical data expanding current knowledge systems. Within a pragmatic paradigm, in search of practical solutions to identified and agreed upon challenges, we acknowledge that technology design continuously creates new realities requiring novel interventions, designs and methods. We establish that inclusive and transcultural research and development collaborations with indigenous and marginalised communities contributes with new insights and perspectives to the dominating discourse of globalisation and localisation, thereby allowing for the design of alternative futures and knowledges. Positioned within a transforming interdisciplinary research context we further uncover tensions and ethical concerns around established methods and institutionalised research practices. Drawing from our numerous and distinct community technology research projects in Namibia and Borneo we highlight selected and anecdotal findings.

Community technology design

Community technology design (CTD) could be interpreted in numerous ways, considering its underpinning disciplines, which by themselves have multiple definitions and dimensions, such as Human Computer Interaction, Technology Design, Community Development and Socio-cultural theories. Human Computer Interaction a multi-disciplinary field, rooted in Computer and Cognitive Sciences, has meanwhile expanded and appropriated multiple theories and concepts from philosophy, education, ergonomics, and design among others (Hooper & Dix, 2012). Though its main focus is on the interaction between Humans and Computers the empirical emphasis and theoretical lenses vary largely from cognitive models, collaboration and interaction techniques to embodied experiences and meaning makings. Technology design, as a subject, on the other hand is focused on the processes of designing technologies. The processes differ depending on the development context and purpose and have changed drastically over time, in line with major societal paradigm shifts. Thus distinct design paradigms evolved such as user-centred design relying on user models, participatory design politically motivated, interaction co-design of user experiences, as well as community-based co-design aiming for empirical and theoretical cohesion in context. Acknowledging the complexity of defining "Community", we refer to as a group having shared locale, common ties and social bonds (Kepe, 1999). Community development has been approached from different angles, such as an economic growth perspective, a capability approach, sustainable livelihoods approach, and millennium (sustainable) development goals, often emphasizing the importance of ICT and community empowerment. In the context of this lecture, we specifically emphasis the community narratives influencing digital design and representations. Often users or communities have been and still are represented by “the other”, be it the developer or other stakeholders talking on behalf of the community. In the early phases of including indigenous communities’ voices, counter-narratives were produced in response to mainstream stereotyping. In a more matured stage harmonious or alternative narratives can be created representing the communities from within rather than as a re-action to pre-conceptions. Ideally we are striving for reflected accounts by the community which evolve within a dialogue between the community and the external influences. Within socio-cultural studies different angles have been elucidated such as cross-cultural, as differences between cultures; inter-cultural as cultures interacting with each other; multi-cultural as co-existence of cultures involved in joint efforts; and transcultural, as maintaining validity across cultures being independent of a singular culture (Winschiers-Theophilus, Zaman, & Stanley, 2017). While culture has distinct definitions we subscribe to it as being enacted in everyday practice and active in producing everyday experiences (Irani, Vertesi, Dourish, Philip, & Grinter, 2010).

CTD can be positioned alongside the dimensions of its four foundational fields. For example, a cross-cultural user-centred design by means of user and cultural models re-enacts a community narrative by “the other”. The theoretical lens, as well as the methods of design and usage of cultural models reinforce an abstraction of the user, which is inevitably biased by the developers’ background thereby inappropriately representing the user (Winschiers-Theophilus, 2009). We are therefore promoting CTD at the opposite spectrum, namely following a community-based co-design approach, with a transcultural lens aiming for the representation and infusion of a reflected narrative by the communities to the design of technologies (Winschiers-Theophilus, et al., 2017). “Viewed from a transcultural perspective, all existing cultures get a broader meaning, as any of their elements is no longer imposed as a tradition but is chosen freely, like an artist chooses colours in order to combine them in a new way in a painting…, elements of the same culture acquire new colourings and multiple refractions in the transcultural space’’ (Epstein, 2009).

Research premises

Our work is based on three premises. Firstly, we recognise that “designing usable Information Technology across cultures is an art, highly creative, sensitive, situational unique, and contextually self-defined “(Winschiers-Theophilus, 2009), which builds on earlier concepts of situated actions as introduced by Lucy Suchman in 1987. Secondly, we acknowledge 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” (Winschiers-Theophilus, Jensen, & Rodil, 2012). Thirdly, within a pragmatic paradigm, in search of practical solutions to identified and agreed upon challenges, we understand that technology design continuously creates new realities requiring novel interventions, designs and methods. Based on these premises the repositioning of indigenous and marginalised communities within the technology design space and the creation of their own desirable futures is our main concern.

In this context we are guided by the following questions:

1. How do we ensure communities’ logics and values are ingrained in technology products?
2. What are suitable participatory methods to engage communities in the design of tech innovations?
3. How do we ensure community technology appropriation?
4. Can we obtain cross-contextual transferability and dependability of results as a basis for theory building?

We propose a participatory action research approach to community-based co-design aspired to indigenise, innovate and impact. Indigenising concepts, techniques and methodologies of technology design strives to incorporate local values and knowledges, appropriating technologies by the communities. We seek to achieve positive impacts on communities and the society at large, promoting capacity building, self-reflection, empowerment, community wellbeing and sustainability among others. Furthermore, we postulate that inclusive innovation, including previously excluded in the process, has the potential to bring about novel perspectives, solutions, techniques and technologies.

Co-designing with indigenous communities

Since 2008, our research cluster at the Namibia University of Science and Technology (then Polytechnic of Namibia), has engaged in numerous research projects with Namibian indigenous rural communities. A priority has been to co-design technologies with and for the elders, to enable them to digitally safeguard their own cultural heritage and indigenous knowledge. Bidwell and Winschiers-Theophilus (2015) have exposed the complexity and tensions within the digitalisation of traditional and indigenous knowledge, supported by authors accounts focusing on aspects of indigeneity, power relations, embedded cultural logics, and contested practices among others. The intend is to engage scholars and practitioners in an ongoing critical discourse around contentious matters in order to reframe digital safeguarding of Indigenous knowledges.

In our work we have conceptualised community-based co-design as an approach to research and technology design following principles of action research and participatory design. Thus while jointly designing specific technologies we explore matters and research questions that evolve in the process. In order for all participants to have the necessary understanding of opportunities and limitations of technologies and digital media, we explore technologies and prototypes together within the community context. Beside the understanding of technologies, we also engage in a critical dialogue deconstructing mainstream paradigms. In our work with indigenous communities, we have focused on co-designing technologies which can bridge the current communication gap between the elders and the youth. To attend school or for livelihood, many young people have migrated temporarily from rural areas. Thus an inter-generational knowledge transfer, which was often based on an apprentice ship model, by oral or performative means, is no longer ensured. However, with the growing usage of technologies by the youth, the design of technologies supporting dissemination of cultural heritage has been identified as a possibility to safeguard indigenous knowledge.

Accounting for the OvaHerero's ways of knowing with an emphasis on socio-spatial dimensions which attributes great values to place, location, and navigation interwoven with social activities (Bidwell & Winschiers-Theophilus, 2012), we have focused on 3D graphics representations. The process of jointly shaping digital representations of socio-spatial practices has led to numerous research questions and the need for further investigations. For example, the observation that the elders were struggling to recognise certain 3D models, led to a series of studies considering perception and recognition in relation to perspectives as well as meaningful representations of 3D graphics. Objects are generally recognised faster if seen from a familiar perspective. Thus we derived different techniques to explore optimal angles of view within the 3D graphic representations (Jensen, Winschiers-Theophilus, Rodil, Winschiers-Goagoses, Kapuire, & Kamukuendjandje, 2012). We developed PictIT, a technique derived from the Pictionary™ game, where community members draw a concept until the illustration is recognised and agreed upon by fellow community members as an adequate representation of the concept (Winschiers-Goagoses, Winschiers-Theophilus, Rodil, Kapuire, & Jensen, 2012). The drawings serve to inform alien graphic designers about significant features and attributes to focus their designs. Furthermore, we have realised that technologies can serve as tools for joint meaning making shaping further digital representations and features. For example, an evaluation of a graphical metaphor of a delete functionality represented as a hole to dispose of graphical objects, including cows, houses humans, has led to a chorus of disapproval by the community members (Winschiers-Theophilus & Bidwell, 2013). Rethinking a cultural appropriation of the delete concept resulted in the implementation of a "go back to origin" feature (Rodil, Winschiers-Theophilus, Stanley, Kapuire, & Rehm, 2014). Similarly, a systematic exploration of culturally appropriate categorisation, through individual and collective card sorting in different places, suggested a socio-spatial arrangement allowing users to retrieve 3D objects from specific locations on the user interface (Rodil et al. 2014; Rodil, Rehm, & Winschiers-Theophilus, 2013). Such a design unfolds entirely new interface design features and elements leading to intuitive technology usage by community members.

Aiming for cross-contextual transferability of our designs and methods, we have engaged with an OvaHimba community in Otjisa, previously living in Ohandungu in the Kunene region. Early evaluations of the tools have shown that a local appropriation is necessary, including new creations of 3D graphics objects to cater for the OvaHimba traditions and stories. Considering the vast amount of effort to create those objects we tapped into the emerging trend of crowdsourcing to obtain the desired 3D graphics object. Further, in an endeavour to support and sustain the OvaHimbas' autonomy in digitalising their own cultural heritage, we co-designed a task request management system for an android tablet, which enables community members themselves to ask for 3D graphics from the crowd (Stanley, Cabrero, Winschiers-Theophilus, & Blake, 2017). The community has internalised the concept of crowdsourcing through cultural appropriation, mapping everyday objects and processes in the digital platform resulting from numerous co-design sessions.

In a further validation of cross-contextual transferability of methods and designs, we joint an existing research collaboration of the University of Malaysia Sarawak (UNIMAS) with the Penan community in Long Lamai, in the rainforest of Borneo. We introduced the community to the 3D graphics tool as developed in the Omaheke region as well as deployed methods, such as PictIT and others to the local co-design project with great success despite the apparently different context (Winschiers-Theophilus, Winschiers-Goagoses, Rodil, Blake, Zaman, Kapuire, & Kamukuenjandje, 2013). The Penan elders having been nomadic till recently are proficient of a secret jungle sign language, which is composed of meaningful combinations of twigs and leaves on and around the main stick indicating direction and distances. Like in many other indigenous tribes across the globe, the elders are concerned about the lack of interest in indigenous knowledge by their own youth yet have recognised the potential of technologies to bridge the gap. Thus as part of this collaboration we co-created a mobile app for Penan youth as a means to revitalise Oroo' and ensure its everyday use (Zaman & Winschiers-Theophilus, 2015). Firstly, we documented the existing symbols, compositions and techniques to produce combined meaningful symbols with Penan elders. Then we launched into the co-design of a fully functional prototype with the Penan youth exploring their current digital communication idioms, establishing the gaps in Oroo' in relation to their communication needs, co-creating missing symbols, and co-designing interfaces and features of the app (Zaman & Winschiers-Theophilus, 2015).

Across the globe, working with communities and more specifically indigenous communities, requires engagement beyond pre-determined project processes and deliverables. "The *'invisible'* work of engagement is frequently overlooked, and yet it plays an important, often pivotal role within many design-based research projects" (Chamberlain, Crabtree, & Davies,2013). We postulate that in all long term partnerships, roles, responsibilities, expectations and benefits have to be continuously renegotiated within a fluctuating context influenced by outside parameters (such as funding and politics) as well as researchers joining and leaving the different projects. External researchers are often pursuing a career led agenda in terms of seeking to obtain data for publications, grants and further research outputs, on the other hand, community members are often motivated by the benefit of learning, technology usage, safeguarding IK, the intrinsic pleasure of participation, and the desire to maintain community harmony (Kapuire, Winschiers-Theophilus & Blake, 2015). With such conflicting agendas it would be desirable, prior to research projects, to reach certain agreements in regard to appropriate (inter)actions, expected adherence to cultural protocols as well as the development and observance of suitable ethics guidelines and policies. Currently, community engagements are being guided by patronising ethical guidelines, subjectifying communities under the pretends of "doing no harm", rather than establishing symmetric and mutual beneficial collaboration agreements. For example, we have established how students engaged in "real life" settings, analyzing, contextualizing, and developing prototypical solutions benefit academically, we have seldom looked at long term effect on communities after the completion of a course, a project or short-term engagement. Thus we advocate that communities who provide extended educational platforms for students' learning and research activities should be recognized as such and relations be institutionalised. Under the theme of "Rethinking University Engagement in Africa" we argue further that collaborating with indigenous communities requires a fundamental re-conceptualisation of mainstream and traditional research and teaching paradigms. In most cases indigenous communities are considered the object of study rather than research partners who over centuries have generated and disseminated knowledge. Indigenous knowledge systems have proven to be resilient and valuable in many disciplines, yet no formal recognition has been attributed. E.g. no indigenous epistemologies, methodologies or methods feature in university research methodology curricula. Our learning "from" communities has often been narrowly focused on the defined engagement reduced to publishable research results. Teaching and learning strategies do not acknowledge community learnings besides formalized service learning courses. Thus neither curricula nor pedagogical approaches have embraced learning from community engagements. In order to foster communities as educational collaboration partners we suggest that community members constitute representatives on university boards, like on the ethics boards; recognized wise elders become adjunct professors; short and long-term benefits to the community are defined and incorporated into engagement strategies. It is essential that best practices and lessons learnt are systematically documented to inform further collaboration efforts. Surveys with stakeholders should be conducted regularly alongside the engagement. Past investigations into our community members' participation in academic activities has defined new collaboration efforts and strategies. Thus we welcome a systematic and collective effort of collecting best practices to acknowledge communities as educational partners in future University engagement strategies (Winschiers-Theophilus, Kapuire, & Stanley, 2017).

Applying an afro-centric lens to re-framing technology design research not only pushes the boundaries at a theoretical and conceptual level but also from a methodological perspective. Reviere (2001) proposes five canons against which research should be judged for the accuracy of the representativeness of the lived experiences of all people. Ukweli, where the truth is grounded in community experience; Uhaki, as maintaining of group harmony; Kujitoa, with the focus on knowledge construction; Ujamaa, suggesting the immersion of researchers into the community; Utulivu promoting justness of research ensuring group harmony. The acknowledgement and application of the canons shifts research practices to a community-based validation and determination questioning researchers' frameworks, scientific objectivity as well as legitimacy of deployed methods of data collection, analysis and most and for all interpretations. For example, consensus building stands in direct opposition with the technique of aggregation of distinct individual data sets, or the necessity to immerse versus maintaining a 'professional' distance. Thus within a new research paradigm, methods and techniques are to be scrutinised.

Co-creating alternative futures with children and marginalised youth

A persistent question in future design has been, how we can possibly design for the unknown, the imagined, the unreal, envisioned better futures, based on which principles and values, pursuing which goals and agendas? Nardi (2016) in his article: "Designing for the future but which one?" describes four very distinct approaches. Steampunk, looking backward based on a critique of industrial society, promotes recycling, with a political and economic looking forward perspective. Multi-lifespan design looking approximately 100 years ahead encourages designers to create adaptive infrastructures capable of responding to changing real life problems. Speculative design, looking into the future through the creation of discursive but not real objects unfolds into generating a multitude of worldviews ideologies, and possibilities. Collapse informatics, considering the past and the future requests planning for the possibility of collapse. With very different foci those approaches lead to various designs and opportunities for future creations. In the following we present a few examples of our empirical work with children and marginalised youth.

Co-designing with children

Research on co-design with children is slowly increasing, as designers have recognized the potential of involving children leveraging their creativity. We acknowledge that children cannot "replace" experienced designers but without doubt "children are experts at being children" (Fails, Guha, & Druin, 2013). We have committed to a long-term collaboration with the Peoples' Primary School (PPS) in Windhoek in an endeavor to co-design and build an interactive tech library. The aim is to co-create space and technologies for learners to enhance reading and more generally learning experiences in accordance with 21st century information and knowledge need trends. We have so far engaged 19 learners from PPS into regular co-design sessions of their very own library. Ensuring that the children are designing spaces and technologies for a variety of children not only for themselves we have appropriated a well-known technique, namely Personas which originated in the user-centered design paradigm (Itenge-Wheeler, Winschiers-Theophilus, Soro, & Brereton, 2018). The children created four distinct personas varying their liking and skills of reading, assuming different related learning needs influencing design ideas. The children then created a common space using different materials, such as wood or Lego blocks, clay or recycling materials to accommodate all four personas with specific technologies. In the process different needs were accommodated, such as a quiet corner for the child who loves to read quietly, animated projections for the physically active children, and many more. A number of technologies were prototyped by the Mobile Development Honors students after co-designing with the children, including a magic mirror, a QR code treasure hunt, a spin the bottle reading cards and other apps (Itenge-Wheeler et al. 2018). The research study demonstrated that children can design for other children, that children created Child Personas is a suitable method to create empathy and novel designs as well as that children can directly contribute to technology innovation.

Inclusive tech innovation with urban San youth

The San communities in Namibia have been among the most marginalised, perpetuated through low secondary school enrolments and high school dropout rates (Dieckmann, Thiem, Dirkx, & Hays, 2014). Fernando, Fernandu, Kapembe, Isay and Hoffeni (2018), young urban-based San, strive to reposition the San in mainstream society considering their current lack of agency, education, land as well as the ongoing stereotyping. Thus involved in ongoing projects with the Faculty of Computing and Informatics at NUST, the young San have co-designed personalised augmented reality accessories for their own well-being or for commercial purposes (Kauhondamwa, Winschiers-Theophilus, Kapembe, Costa, Guxab, Kamati, & Afrikaner, 2018). Besides having been exposed to various emerging technologies, the young participants have acquired technical and design skills which they can apply to further projects. From a design perspective the collaboration with the San youth has led to very unique concepts and designs.

Alternative futures for marginalised youth

With one of the highest Gini indexes worldwide and alarmingly high youth unemployment rate, Namibia has prioritised the eradication of poverty and inequalities through promoting entrepreneurship and innovation, as well as other job creation measures. In this light we have been engaging unemployed and youth residing in informal settlements into co-designing technology and services to define new career paths, offer alternative education and increase sustainable livelihood & wellbeing. We are supporting the digital transformation of society through exploring emerging technologies and solutions, such as time banking, social Enterprises, promoting human developments as a result of technology design interventions, while maintaining long-term partnerships to ensure knowledge transfer and sustainability. Major challenges have been the information flow of essential livelihood information to the once most in need of it (Samuel, Taylor, Winschiers-Theophilus, & Nieminen, 2017) and commitment of the youth to contribute towards a common long-term goal while achieving individual goals not immediately tangible (Goagoses, Kambunga & Winschiers-Theophilus, 2018). We have explored multiple techniques and methods to overcome the youth's challenges, among others we have developed "the Havana entrepreneur" as means to combine training of skills, immediate benefits for participants (such as money), as well as long-term solution seeking (Winschiers-Theophilus, Cabrero, Chivuno-Kuria, Mendonca, Angula, & Onwardi, 2017). We have co-designed a crowd-funding system, which enables (social) entrepreneurs from Havana to upload their project descriptions as well as funding requests. However, an attempt to deploy this and other systems beyond the set of co-designers has shown to be problematic, in line with reports from the ICT4D literature. A number of technology adoption models have been developed and modified over the years yet sustaining a lack of technology adoption. Thus we have co-created a technology adoption strategy with volunteers from Havana, functioning as tech ambassadors (Kambungu, Winschiers-Theophilus, & Goagoses, 2018). Besides a successful technology acceptance and usage, a major revelation was that the empirical data demonstrated the inadequacy of the underlying psychological theory of mainstream technology adoption models, namely the Theory of Planned Behaviour (Ajzen, 1985). We postulate that in non-organisational settings future technology user rarely build attitudes and behaviour intends before using technology but are rather influenced by social factors as well as the capability to use it. The latter two can be fostered through enablers which are infused into technology deployment contexts (Kambunga et al. 2018).

Conclusion

In response to the research questions posed earlier, we conclude that: firstly, communities' logics and values can be ingrained in technology products, if indigenous knowledge holders and communities are research partners and co-creators of technologies, as well design concepts and methods are situated in a local epistemology; secondly, suitable participatory methods to engage communities in the design of tech innovations are explorative methods and probes, adapted and created methods within the context, as well as established co-design tools**;** thirdly, technology design enables communities in reflecting on their own context, making new meanings and take conscious decisions as to technology design and use thereby allowing for technology appropriation; fourthly, cross-contextual transferability and dependability of results as a basis for theory building, can be achieved within community-based co-design research based on principles of action research and participatory design. Based on our conceptual and empirical work we conclude that Inclusive and transcultural design research collaborations with indigenous and marginalised communities leads to new insights and perspectives to the dominating discourse of globalisation and localisation, re-positioning of participating communities, new knowledges and designs of alternative futures.

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