Land, Letšema and Leola: Digital Transformation on a Rural Community's Own Terms

Kgopotso Ditshego Magoro [1][2] and Nicola J Bidwell [3][4]

[1] University of the Witwatersrand, Johannesburg, South Africa
[2] Mamaila Community Network, South Africa
[3] Aalborg University, Copenhagen, Denmark
[4] International University of Management, Windhoek, Namibia

kdmagoro@gmail.com nic.bidwell@gmail.com

Abstract. Eurocentric paradigms for technology continue to dominate in Africa yet can impede digital transformation by perpetuating senses of inferiority in societies that have endured colonialism and apartheid. This chapter describes how an African creative pedagogy, Mandhwane, is enabling inhabitants of Mamaila, in rural South Africa, to negotiate the meaning of transformation on their own terms. Since 2018 inhabitants have been establishing their own telecommunications system, or Community Network (CN), to provide local internet access and digital services www.mamailanetwork.co.za/. The CN acts as a "land" where inhabitants freely co-create, which is a vital aspect of Mama Tshepo Khumbane's philosophy of doing Mandhwane in transformation. The first author applied Matshepo's techniques to help inhabitants recognise their existing capability to solve their problems by Letšema, or collective work. Our analysis focuses on designing an app to support Leola, a locally created community scheme in which households collaborate to support bereaved families with funding, equipment and human resources, in funerals and burials. We reflect on the ways that locating design within a rural CN and framing innovation with Mandhwane fosters communal and individualised agency, embeds a social relational ontology in innovation, and can tackle tensions that often arise in digital transformation, such as those that result from differences between older and younger people and between local and externally imposed timescales.

Keywords: Cultural knowledge systems; Decolonising technology; Community Network; Ubuntu; Personhood; Motho ke motho ka batho.

1   Introduction

"Help me to transfer scientific knowledge into grassroots level by teaching rural children to play Mantlwantlwane. I am ageing, I no longer have the physical power and the energy to play Mantlwantlwane", Mmatshepo urged Kgopotso when they reunited in 2017. They had first met a decade before when Kgopotso had visited Mmatshepo's farm and had occasionally and joyfully reconnected in the years in between. This time

though, the renowned South African development activist's insistence carried frustration and a sense of betrayal. "Many people wrote about my life. My knowledge has produced professors and consultants", she said, "but they all reduced me to Mama Tshepo who plants vegetables and creates underground water dams. They missed my core philosophy of Mantlwantlwane".

Mantlwantlwane is a traditional pedagogy in many southern African communities, where learning occurs through doing, as people improvise, receive feedback and adapt, but Kgopotso did not know how to respond to Mmatshepo's request that she write a book about it. She began driving the 50Km to the Cullinan farm regularly and, as they processed grapes, lemon, lime and kiwano together and analysed the environmental and weather data that Mmatshepo had collected (Fig. 1), Kgopotso learnt about Mmatshepo's approach. Along with the garlic, kiwanis and rosemary and the aloe and other indigenous plants to grow in her own backyard, she took home recordings of Mmatshepo's stories and an embodied knowing about what those stories mean. At the time Kgopotso was considering a proposal for a PhD and, as she ghost-wrote 'The Spirit of Hope' to reflect Mmatshepo's experiences, she realised her research journey would be about Mandhwane as spelt in Selobedu: a dedication to Mmatshepo and a reclaiming of her own cultural identity.

Fig. 1 Left: Kgopotso (left) learns how to process Aloe vera with Mmatshepo (right). **Right:** Kgopotso explores Mmatshepo's weather data. Both photos: Bophelo Mahlabaseletsi, 2017

This chapter illustrates the digital transformation enabled by situating technology design, deployment and use in an African creative pedagogy. For the past 3-years, co-author Kgopotso and rural inhabitants of Mamaila have been doing Mandhwane to establish a Community Network (CN), which provides local internet access and innovates new digital services. The word Mandhwane is often used pejoratively to describe systems that lack excellence or structure, yet Mamaila's CN and digital services are avoiding the conceptual mismatches, limited local ownership, early failure and amplified inequality that often emerge when technology and innovation paradigms

are imported to the Global Souths (e.g. [12, 27, 59]). Thus, we contribute empirical insights about a decolonial approach to innovation in rural Africa by describing the role of Mandhwane in innovating an app to support local practices.

We organise this chapter to convey the richness of the relational ontology that Mandhwane engages with. We seek to minimise the epistemic violence [55] that occurs when the structure of reports about transformation exclude local contributions and meanings. Mmatshepo recognised that creativity is impeded by diminishing local experiences, values and problem-solving approaches and, as Section 2 describes, applied techniques to community development that liberated people from these constraints. Owning an environment in which to freely co-create is vital to Mmatshepo's techniques and in Section 3 we propose that Mamaila Community Network is a place in which inhabitants undertake Mandhwane to innovate and negotiate the meaning of digital transformation on their own terms. Section 4 outlines the African cultural framework for technology that orients Kgopotso's ongoing action research with Mamaila Community Network. Our analysis, in Section 5, focuses on designing an app to support the cultural practice of Leola, a community scheme that supports bereaved families by contributing to funerals and burials. We describe how Leola depicts local logics and relations and how Mmatshepo's techniques helped inhabitants to recognise their collective resources. We conclude by reflecting on the ways that locating design within a rural CN and framing innovation within Mandhwane tackles some of the tensions that emerge in digital transformation and fosters communal and individualised agency.

2   Mmatshepo's Mandhwane and Mind Mobilisation

Young children in Mamaila still play Mandhwane (Fig. 2). Observations of Mandhwane in other southern African communities, where it is called Mantlwane or Mantlwantlwane (Northern Sotho), Mahundwane (Venda), Mahumbwe (Shona) and Imizi (isiXhosa), suggest learning occurs through doing as children improvise their own versions of their elders' practices. Children learn mathematical skills by constructing "homes" with the stalks of corn left after harvesting, and looking for, preparing and preserving "food" made with leaves and mud [57]. In their miniature village, they also learn the social skills needed to be active and effective members of society. Older children enact the roles of mother and father to the younger ones [46], which in the past developed their proficiency in domestic and family affairs [24]. Sometimes elders gave feedback (e.g. [19]); for instance, when children in the "couple" role sought guidance to resolve a dispute or a "wife" presented a meal to the "mother-in-law" - the actual mother of the boy in the husband role [38, 39]. This supported future relationships if, say, a "couple" married in later life. While the gendered roles rehearsed in Mandhwane have attracted feminist critique, African Womanists argue that the pedagogy aligns with women's pursuit of a sense of completeness through family, home and career [44]. The Balobedu people of Mamaila are, in fact, a matrilineal dynasty [45].

Mandhwane was the primary means for sharing knowledge and learning skills in South Africa before European colonial and Christian missionary exercises introduced

their education systems [32]. The customary educational practice supports the principles that, Adeyemi and Adeyinka (2002) [2] propose, characterize African onto-epistemology including communalism, through collective learning; preparationism by role modelling; functionalism by imitating; holisticism through multiskilling; and perennialism by preserving culture. Mandwhane has, however, been underappreciated as a creative pedagogy, or an approach to learning that integrates problem solving and responds to political and psychological as well as the social aspects of people's development. Treating children as human beings who are free to express themselves in settings they create themselves and who know what is right and wrong without paternalism [19], indeed promotes creative agency.

Fig. 2. Children from Mamaila playing Mandhwane. Photo: Hlokomelo Mabogale, 2021.

Recognising the importance of culturally-grounded and socially-supported creative agency, grassroots activist Mama Tshepo Khumbane framed community development in Mandhwane for over forty years. Mmatshepo's experience of apartheid oppression convinced her that the nationally prescribed education system was unhealthy [63]. She believed that people need to accept and confront their situation and control their own lives by doing something constructive with whatever few assets they had and without relying on government and external aid. With her encouragement, communities made gardens and grew crops, using methods to fertilise organically and retain soil moisture; cleaned springs to purify water; built houses; and, made mud stoves for baking and

cooking [8; 20]. Mmatshepo situated scientific knowledge in the work; for instance, as they built and maintained their agricultural and irrigation systems people created rain gauges, monitored weather patterns and logged daily activities in charts.

Mmatshepo argued that "poverty of the mind" prevents people from embarking on constructive activities and sought to enable Black people to liberate their minds and heal the psychological damage of colonisation and apartheid. As a trained social worker, she had adopted the group casework approach, in which all group members actively contribute to mutual support, and learn to understand and build on each other's experiences, situations, problems, dilemmas, perspectives, strengths and weaknesses. She integrated a reflective process into her facilitation practice that recognises that transformation inherently links an individual self to social dynamics. However, beyond appreciating intrapsychic dynamics of group casework, such as the impact of group size, roles, norms, communication patterns, member interaction and influence [33], Mmatshepo's approach was situated in a particular philosophy about personhood, or what it means to be human. Often known by the isiXhosa word Ubuntu, this philosophy assumes being human depends on the simultaneous and dynamic constitution of other humans and neither community or individual is prior. That is, a person exists because of other people, or in Northen Sotho and Selobedu: Motho ke Motho ka Batho. Thus, Mmatshepo's Mind Mobilisation technique engaged people in reflecting on their social, economic, political, and psychological challenges situated within a communal entity that shared norms and value systems.

Mmatshepo's rural upbringing entwined a familiarity with traditional farming methods with rituals, ceremony and stories that reinforced the importance of land in co-creating the social system. "Without all the holding hands together and an environment which has been created by the people themselves and the institutions to allow that to happen it [transformation] will not work" [Kgopotso audio recording, Pretoria, 7 April 2017]. Mmatshepo realised that people had the power to do Mandhwane and freely create solutions and enact plans for their lives provided they form a Community of Practice (CoP) around their own land. Owning land, even a small yard, enables a person to express their creativity without constraint and, within a CoP, gardens contributed to both household income and local food security by distributing surplus harvest.

3   Community Networks in Decolonising Transformation

Kgopotso has been doing Mandhwane in helping to establish Mamaila Community Network since 2018 [35]. CNs, or telecommunication systems that are owned, set up and managed by inhabitants of the areas where they are deployed, have been long proposed as ways to provide communications to people who cannot access alternatives [53]. With increased affordability and usability of equipment, such as solar-powered GSM base-stations to provide mobile telephony and Wi-Fi routers to provide internet connections [4], CNs have proliferated around the world. As we explain next, they offer places for decolonising innovation because their members co-create meanings about technologies embodied in their everyday lives [12] and in settings that they own.

3.1 Decolonising Innovation in Africa

Research in the field of Human-Computer Interaction (HCI) over the past five years describes how technology production within Africa has been shaped by a paradigm that originated in Silicon Valley through digital policies, tertiary and higher education, training in digital projects, and investment in and coordination of tech hubs and start-ups [3, 5, 6, 18]. Along with amplifying existing inequalities (e.g. [26, 59]), this paradigm reproduces imperialist superiorities and racism, which has prompted scholars in Africa to advocate for decolonising technology design [1, 7, 9, 34, 47]. Much of this advocacy, however, focuses on the identities of African HCI researchers and designers in technology production rather than on decolonising innovation within the activities of diverse Africans' everyday lives, such as rural inhabitants.

Generally African rural dwellers express insights to inform software development within activities determined by urban-based technologists and researchers, rather than enabling all participants to co-construct learning in design (e.g. [31]). This tends to reproduce beliefs that an effective society follows certain processes in education, innovation and technology production. Indeed, despite discussions about designing technologies to support African educational traditions, such as learning by doing [41], moral reasoning [42] and the nuances of cooperation [14], there are no published examples of situating design and development within an explicitly African creative pedagogy, such as Mandhwane.

Studies in HCI and the field of Participatory Design (PD) draw attention to the importance of accounting for temporal and spatial relationships in rural Africa [11, 13]. Yet, with few exceptions (e.g. [16]), African land is rarely positioned as a key actor in digital transformation and continues to be occupied [54]. Thus, considerations might be critiqued for not engaging with literal decolonisation [30, 60] nor accounting for relations between people's ownership of physical infrastructure and their agency in creating solutions and enacting plans for their own lives.

3.2 Grounding Community Networks in Mandhwane

Local ownership means CNs can offer settings for digital transformation that contrast with environments shaped by universalised design methods and corporate control of telecommunications provision and regulation [11]. Each of the, over 30, CNs that now participate in the annual Summit on Community Networks in Africa [58], emerged in their own local social and spatial contexts [25]. For instance, Bosco provides internet access to many small, self-organised centres across hundreds of kilometres in Uganda's Northern and West Nile regions [12] and PamojaNET's La Différence CN provides free internet during off-peak times, via Wi-Fi and a public access kiosk, to the population of Idjwi Island in the Republic of Congo's Lake Kivu. There are at least five CNs in South Africa, where a few large telecom companies prioritise provision to high revenue urban markets and price their services for people who can afford their tariffs [49]. Several serve urban and peri-urban townships, such as iNethi in Cape Town [48], while others address poor quality telecommunications in rural areas, such as Zenzeleni Networks in the Eastern Cape [50].
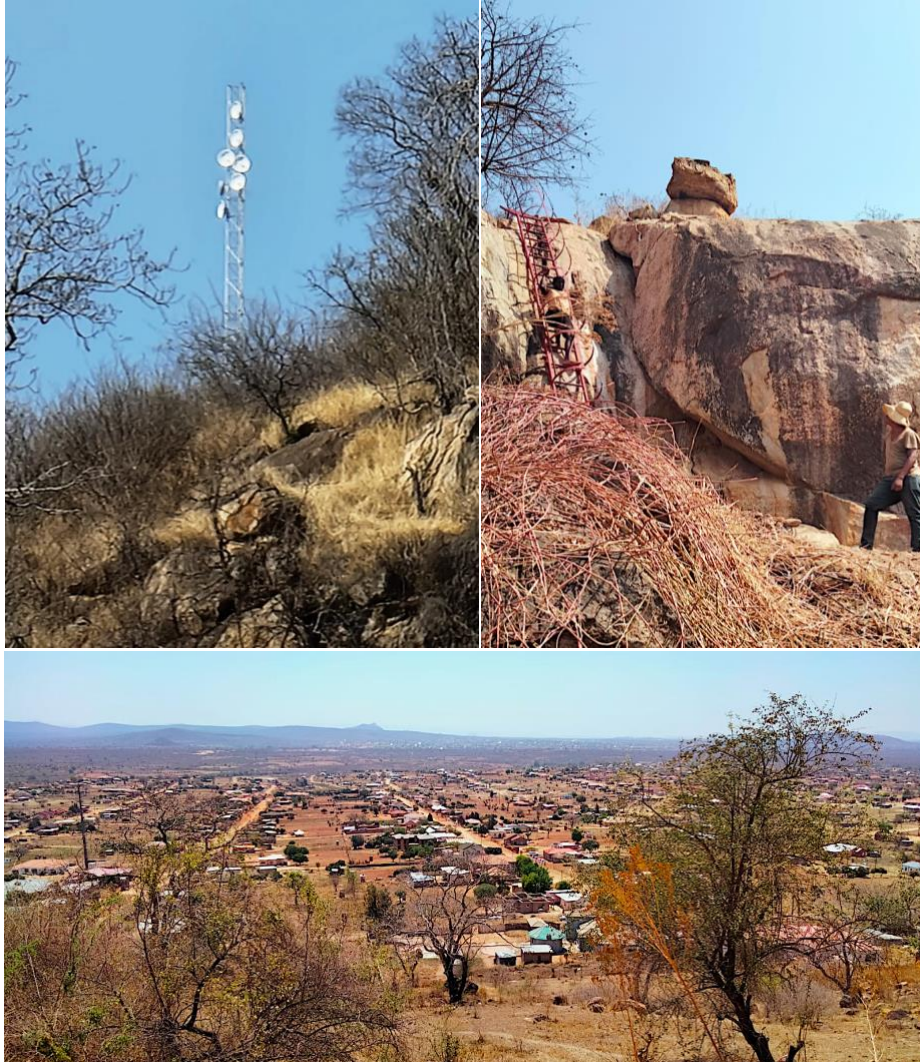
Fig. 3. Top left: the tower and dishes that were installed to provide backhaul for Mamaila Community Network, photo: Pardon Mabunda. **Top right**: a permanent ladder was installed to enable accessing the tower. **Lower:** view over Mamaila from the site of the tower.

Mandhwane has shaped the development of Mamaila Community Network in Limpopo Province from the start. While Kgopotso had taken an online course about CNs in 2017, it was insights from her visits to Bosco Uganda and Zenzeleni Networks that inspired her to introduce the concept of CNs to Mamaila's inhabitants. She organised a hands-on workshop in Mamaila where, assisted by Soweto Wireless User Group (SOWUG), participants created their own ethernet cables, assembled a parabolic antenna, configured point-to-point connections and, along the way, learnt the basic set-

up of the internet. Encouraged by the workshop, Kgopotso explored the feasibility of a CN by deploying a Wi-Fi, for three months, that provided free internet to a school, a Disability Centre and a church in one of the villages under the jurisdiction of Mamaila Tribal Authority. Community members who had participated in the earlier hands-on introduction attended another workshop to test the Wi-Fi and discuss their experiences, aspirations and network requirements. Insights from the pilot informed the design of Mamaila Community Network and, with seed funding from the Internet Society (ISOC) in the past two years, Mamaila's inhabitants set up wireless backhaul (Fig. 3) and permanent access points to all six villages.

Mamaila Community Network (www.mamailanetwork.co.za/) is now licensed to provide local inhabitants with internet access and digital services, such as offline educational resources. As importantly, and much as Mmatshepo conceived people's use of their own land in Mandhwane, the CN is an infrastructure that enables inhabitants to use the electromagnetic spectrum of their Wi-Fi in Mamaila within a creative pedagogy. Transformation through this Digital Mandhwane [35] cannot be assessed according to externally imposed project plans, metrics or value propositions. Neither quantified outputs, such as the number of people trained or the frequency of inhabitants' technology use, nor measures of project productivity within certain timeframes, can depict the culturally-appropriate agency that emerges in co-creating and enacting plans in a community's own 'digital land'. Thus, as we explain next, Kgopotso sought an alternative paradigm to guide technology design and her action research.

4 An African Cultural Framework: Positionality and Paradigm

Kgopotso's contribution to Mamaila Community Network is best expressed through the proverb "Mmetla shapo la tlala o betla a lebile ga gabo", or anyone who aims to solve social ills must start at home. Kgopotso grew up in one of the six villages under Mamaila Tribal Authority, in the region settled by her ancestors when they migrated from present-day Zimbabwe roughly 400 years ago. Her research for her Masters degree, about the challenges of internet connectivity in Mopani District, Limpopo, motivated her to help establish Zuri Foundation, a women-led Not-for-profit organisation (NPO) that aims to develop capacity and provide internet access in villages. Although based in a city 300 km away, where she works in senior technical management for a government ministry, she returns home to Mamaila regularly. Kgopotso is fluent in Selobedu (also spelt Khelobedu), the marginalised language of the Balobedu tribe, but she did not join in all local practices due to her family's Christian beliefs. As a child she had also observed her cousins and peers play Mandhwane, although she was disinclined to express herself or take orders from her peers in order to join in their play. Thirty-three years later, however, her engagement with Mmatshepo for over four years ignited her appreciation of Mandhwane [36].

Kgopotso's and Nic's positionality contrast. Nic is white, Australian and British, has lived in many countries since starting life in the Sudan and has not yet been to Mamaila. Nonetheless, when we first met, through the African CN movement four years ago, we discovered common commitments to life nourished by the African soil and culturally

sensitive approaches to technology innovation and design research. Our account draws on Nic's HCI expertise and experience for 14 years undertaking research while employed in university departments of computing, and living in rural South Africa and Namibia including in the place where Zenzeleni networks began.

Kgopotso interviewed Nic while determining a paradigm to guide technology design in Mamaila and the action research for her PhD. Kgopotso's formative research about rural internet connectivity sensitized her to the importance of culturally-embedded digital transformation and her role as a cultural activist. The Eurocentric paradigms that dominate research and innovation make it difficult to specify what culture actually means within a specific community. Thus, Kgopotso sought to learn from the experiences of people who had worked at the intersection of technology, innovation and cultural knowledge systems in southern Africa and thereby ground her pursuit of a paradigm in Mandhwane. All 19 experts and practitioners that Kgopotso interviewed explained culture using examples of practices and processes rather than defining exactly what culture is. Thus, she conceived an African cultural framework for technology that would engage with social, economic, political, educational, health, justice, identity and heritage practices [37].

Kgopotso's African cultural framework shaped her use of standard research instruments, including surveys, interviews, Focus Group Discussions (FGDs) and workshops. To generate data she prioritizes local cultural practices, often without mentioning technology and, establishes rapport with inhabitants based on a shared cultural identity, for instance by discussing what her family totem means to her. Kgopotso limits the effects of linguistic and epistemic translation by conducting all engagements in Mamaila in Selobedu. However, she transcribes in English to in order to use the tools available for software design and qualitative analysis, such as AtlasTi, and write academic reports. Technology specialists had also recommended that Kgopotso use Design Thinking, a technique conceived in Silicon Valley and promoted as a 'standard' to engage users, determine their needs, identify requirements and design prototypes [29]. However, formulating user needs in certain ways limits holistically locating technical solutions in everyday community practices and does not address social, psychological and political relations of digital transformation, unlike Mmatshepo's techniques.

5   Situating Innovation in Mandhwane

Our account focuses on the ways a particular cultural practice, Leola, guided the design of a digital service that supports local cultural knowledge and values. Leola is a community financial scheme in which participating households collect money and provide bereaved families with funding, equipment and human resources for funerals and burials when needed. Although she wishes to be buried in her village, Kgopotso did not know all aspects of Leola at the start of her research. She only began to consider it in technology endeavours as she collected data and realised that Mmatshepo's philosophy of Mandhwane suited the ways the locally innovated scheme connects households into the broader community.

5.1 Documenting Cultural Practices and Tuning into Leola
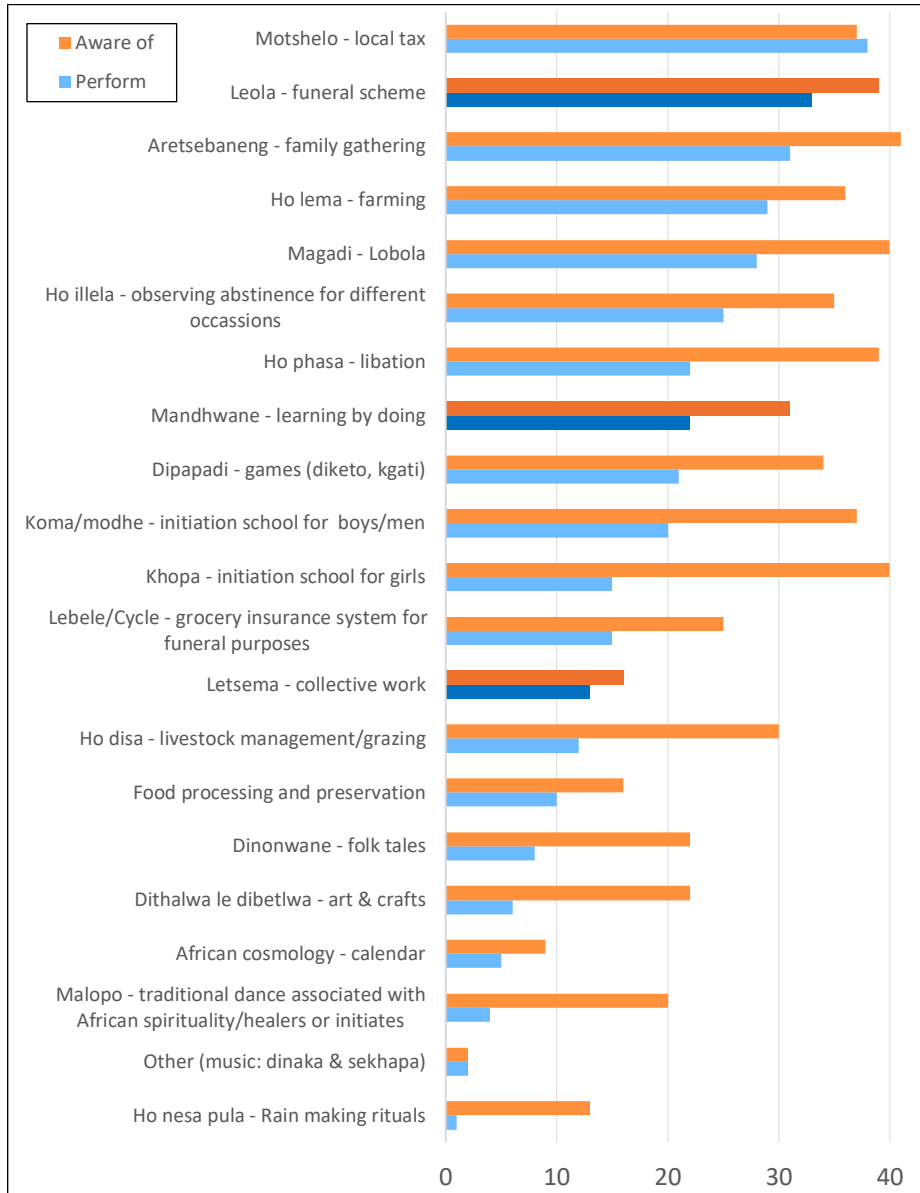

Fig. 4. Frequency of awareness (blue) and performance (orange) of cultural practices in 50 households in two villages in Mamaila. Leola, Mandhwane and Letšema are in darker tones.

Kgopotso started by surveying cultural awareness and practices, as well as digital patterns. She consulted with permanent inhabitants of Mamaila village to fill gaps in her knowledge and co-create closed-ended questions, and two local research assistants

administered the survey to households in two villages in Mamaila. The most commonly performed practices mentioned were: Motshelo, or administrative tax paid to the Tribal Office (which performs local government roles); Leola; Aretsebaneng or family gathering; and farming (Fig. 4). Koma, or initiation, is also widely performed, however, while most respondents did not consider that it conflicts with Christian life, unlike earlier converts, its cultural sensitivity makes it difficult to discuss. Nearly half of respondents stated they had performed Mandhwane, although it was not quite as widely known as other common practices.

To further understand intersections between local culture and technology and identify community needs, aspirations and processes that technology could support, Kgopotso facilitated a FGD with representatives of Mamaila Community Development Forum, which handles Mamaila Royal Council's development agenda. Community leaders, in the FGD, emphasised that governance embeds the philosophy of Motho ke motho ka batho, and that digitisation would benefit processes that express Motho, such as Leola. For instance, digital announcements and mobile money transfers might help people who are based in cities for work to ensure they don't miss payments because they are unaware of a death. Thus, Kgopotso focused on Leola because it offered the potential for digitally facilitating social cohesion.

Based on community leaders' suggestions Kgopotso interviewed a representative of one of Mamaila's Leola groups who outlined the history of Leola, the structures supporting it and how Leola interacts with other cultural practices and financial processes within the community. Leola originally emerged when neighbours in one village supported bereaved families and it spread as inhabitants observed others when participating in funerals and modelled their practice. The scheme embeds the value of honouring the departed with O bolokegile, or "burying in dignity", such that funerals meet communal standards for food supplies, number of people and community support.

While Leola is grounded in common principles, inhabitants are not formally taught about it but learn by doing and evolve their processes along the way. For instance, nine sections, comprising one village, established an executive committee with a formal constitution signed by the Chief. The executive committee enables sharing good practice, discovering solutions to challenges and coaching and mentoring about governance and conflict resolution by drawing on the encouragement and guidance of the Tribal Council (the Chief and his Ndunas/advisors). While people comprising the Leola group's executive committee were born before technology, the representative said that technology could bring benefits to announcements, record-keeping and asset management. However, COVID-19 prevented face-to-face discussions with representatives of all nine Leola groups, which are at different stages of advancement. Thus, Kgopotso sought a more collective conversation that would align with Mandhwane, to validate her findings, further consider how technology currently intersects with cultural practices, identify processes that might benefit from digitization and engage participants in co-creating prototypes.

5.2   Mobilising Minds and Planning to Support Cultural Knowledge

Informed by her preliminary insights Kgopotso hosted a workshop for community representatives at Mamaila Tribal Authority offices. Six women and nine men, aged between 25 and 73 years, participated in the workshop including representatives from Mamaila villages' headquarters, and from the Leola group of one village. Mind Mobilisation began with participants addressing senses of inferiority by recognising their fears and prior knowledge in relation to technology. They recounted stories about their first experiences with the internet. Even elderly people had positive, along with negative, accounts about their daily interactions with technology. Many participants feared online scams; however, they also observed that scamming arises in off-line processes. Kgopotso insisted that the community already demonstrated the capability to address off-line problems by collective work, or Letšema, an economic and social system grounded in the philosophy of Motho. She pointed out, for instance, how a group had crowdfunded a storehouse to store their assets for funerals (Fig. 5) by collecting a brick from each household. Thus, participants discussed local cultural practices to validate collaborative activities listed in survey responses, such as farming, savings groups, initiations, weddings and funerals, and identify collective resources.

Fig. 5 Left: Storehouse for assets built by a Leola group using Letšema. **Right:** Assets lent for funerals

Agricultural activities are prominent collective work and, echoing Mmatshepo's philosophy that land is needed to play Mandhwane, Kgopotso framed the infrastructure of Mamaila Community Network as "land". She referred to the seasonal calendar to prompt linking cultural preservation and collectivity. Unlike conventional modern farming, when most work occurs in planting and harvesting, traditional farming happened throughout the year: Seruthwane, or spring, when the soil and seeds are prepared; Selemo, or summer, the time for ploughing; Lehlabula, or autumn, for

harvesting and preserving; and Marega, Initiation season, when food is processed and crops like spinach are planted. Participants often struggled to name the seasons in Selobedu, reflected on loss of cultural memory and the importance of preserving culture for future generations. They referred to a prototype of a heritage website Kgopotso had implemented; noting that it did not depict many local cultural artefacts and recommending content about the names of artefacts, clothing from former eras, and audio recordings of different historical music genres.

Fig. 6 Mind mobilisation participants review the Leola process documented by Kgopotso. Photo: Joey wa Rabapane, 2021

Mind Mobilisation revealed how Leola is an innovation that includes inhabitants with varying cultural knowledge. When participants reviewed the Leola processes (Fig. 6), that Kgopotso had documented from the interviews, their only amendment was that some groups in Mamaila deliver funds directly to the bereaved family instead of allowing collection by representatives of the bereaved family. The review prompted discussing different challenges experienced by one Leola group. Administrators in one group sometimes lost information stored in books; households do not know how much money is available from the generated files; family members in cities fell behind with contributions because messages were not distributed sufficiently; disputes arose around missing or damaged assets, such as chairs lent for use during funerals; and "scammers" did not always give bereaved families the full amounts the group had collected.

Participants also noted that as Leola had diffused into new settlements, new groups had not adopted the methods that mature groups had evolved and some were dominated by younger members unguided by elders. Thus, new groups do not always adhere to governance processes that promote social cohesion and Leola was exposed to practices that poorly align with the values of Motho, such as by using the collected funds more extravagantly. Participants suggested that technology could help educate people about the values of Leola, address concerns about financial accountability, communication, assets management and knowledge sharing, strengthen social networks, and be used in crowdfunding to solve other community challenges. Some of these ideas fed into their Helicopter Plan, Mmatshepo's technique for visioning, action planning and self-monitoring which emphasised collaboration as a foundation for innovation. Participants

agreed on an action-list: to collect information about the cultural artefacts for the heritage website and contribute to developing an app to support Leola.

5.3   Translating Leola into the Mamaila Community App

After the workshop that applied Mmatshepo's techniques Kgopotso translated insights into the basic functionalities of an app to support Leola. User groups included the mostly elderly Leola Administrators who inform members in their sections through meetings by word of mouth; manage assets; collect and record contributions to funerals and fines from members whose payments were late or who damaged assets. Two other user groups comprised household members who contribute Leola payments and report deaths, and Tribal Authority representatives who make announcements to the community. The app enables administrators to announce deaths and meetings, record contributions and fines, and manage an inventory of assets. To support transparency, functionality enables household members to view the total amounts collected, fines issued and donated to each bereaved household and the status of assets. Household members can also report deaths and other incidents that have caused distress, such as robbery; and Tribal Authority representatives can post notices.

Some months later, and following principles of Mandhwane, an elder advised and mentored Kgopotso about introducing the app and suggested that other clan-based funeral schemes could use the app's functionality. Reflection on the elder's insights, and other participants' comments about how Leola might scaffold a process to help people address their economic challenges, prompted 'rebranding' the app to permit future extensions to support other activities, such as developing the website. The resulting Mamaila Community App [40] prioritises the Leola functionality but also enables community members who do not belong to a specific Leola group to report incidents and receive the Tribal Authority's community announcements. Bearing the slogan Motho ke Motho ka Batho and with all interfaces written in Selobedu, the app will run on Mamaila Community Network where users can access it without paying for data and it can stimulate conversations about local digital services. Indeed, the involvement of ten youth who tested the app suggests its potential to motivate youth to create other localised apps. Exchanges on WhatsApp amongst youth as they explored an earlier iteration were punctuated with the emojis for praise, awesome, approval and achievement; "this app could actually make life simple yaz.. i see your vision there wow i give you the hat", one wrote. Their comments suggest the app surpasses expectations about what a home-grown innovation would be "Yoh, its actually nice" and "I'm actually impressed" another youth wrote.

Enthusiasm was reiterated when Kgopotso introduced the app to over 30 people representing Leola groups, the Tribal Office and Mamaila Royal Council (the royal family) in a hands-on workshop recently. Despite enthusiasm, however, participants proposed that manual Leola processes should continue in parallel until everyone is comfortable with the app. Participants were aged up to 73 years old, but approximately a third were aged 25 to 30 years and participated to test the app not because they were members of Leola. The participants who were under 44 years old were particularly quick to express their support of the necessity and simplicity of the app. However,

concerns were raised about use by elderly people who don't own smartphones, cannot read and write and may depend on their grandchildren to help them. While supporting the app, one elder implied that such dependency may expose people to scamming by their grandchildren. This sentiment and a youth's response to it indicate different generational perspectives on inclusion. One younger person felt that elders sought to protect and maintain power and, thus, ignored youth's perspectives, and that basing the app and the workshops around Leola, which is currently dominated by men, makes digital transformation exclusive. Others, however, are hopeful that the app might bridge the gap between elders and youth by building on inhabitants' creativity in innovating their Leola together.

6 Conclusion: Mandhwane in Transformation

The creative pedagogy of Mandhwane is expressed in multiple ways in innovating the app. The non-digital Leola processes spread as the practice emerged, was imitated and collectively adapted when problems arose, based on elders' guidance. Kgopotso's approach also evolved as she consulted experts about their experience in culturally based technology interventions to inform her technology design and action research paradigm; learnt and validated her understandings about Leola; and guided local residents in roles as research assistants. Finally, technical and social aspects of learning and creating entwined, and prioritised relations between domestic, family and community affairs. Thus, we conclude by proposing that applying Mama Tshepo's techniques in a CN can enable rural communities to embed innovation in a local social relational ontology and negotiate the meaning of digital transformation on their own terms.

6.1 Recognising Personhood and Knowledge in Mind Mobilisation

Participants in Mind Mobilisation reflected on the cultural identity expressed in their everyday household and community activities. While swift to state that their non-digital Leola processes were imperfect, Mind Mobilisation framed this critique as an integral part of innovation. Inhabitants improved their Leola by learning from their own and others' mistakes, just as in formal iterative research and design processes, such as Action Research [23] and Prototyping (e.g. [28]). Proponents of PD have long advocated for inclusive problem-solving approaches to improve the accountability and creativity of solutions (e.g. [51]); meanwhile Sen's work [52] shows the need to leverage people's capabilities in transformation. However, Mind Mobilisation, framed inhabitants' Leola innovation within the local creative pedagogy of Mandhwane and emphasised how communal and individualised agency entwine.

Mind Mobilisation recognised Mamaila's inhabitants as creators who innovated their Leola together. Some HCI studies about producing technology in Africa recognise that "methods make people" [5] and the effects of people's subjectivities on methods. These analyses do not tend to focus on the condition of being human, but rather on people's identities based, for instance, on race, gender, professions and education.

Personhood, however, is a more culturally located concept that entwines with particular ethics about human relations. For instance, independence and self-maintenance are emphasised in Euroamerican models of personhood more than the social relationality emphasised in Motho.

Prioritising human relations is considered critical to the success of development and economic endeavours in South Africa (e.g. [17, 22, 43]) and studies relate the Ubuntu philosophy to technology design, ICT innovations and operating internet cafes and CNs (e.g. [10, 56, 61, 62]). However, such studies do not specifically consider how Ubuntu is integrated into the mutual shaping of technology and personhood in transformation. Focusing on Mamaila's inhabitants' Letšema, or collective work, and their innovation of Leola oriented digital transformation towards a social relational ontology in multiple ways. For instance, while Kgopotso's goal was a personal PhD when she embarked on her research, neither academic contribution nor credentials can define the knowledge the research has produced. Indeed, our analysis shows that learning that is intractably entwined with a community should not be considered inferior to the structures and generalisations that Eurocentric pedagogies and design and documenting paradigms tend to emphasise.

6.2 The Role of Land in Creative Pedagogy

Kgopotso's African cultural framework for technology imagines innovation in relation to local logics that emerged over centuries and not to 'gaps' determined by transnational ideals about progress, growth and empowerment or by a paradigm of technology production originating in Silicon Valley. While Sankofa teaches that it is not taboo to return to the past for the benefit of the future (e.g. [21]), the framework does not imply designing technologies to mimic times past. Rather, local logics are articulated in practices that evolve with time. For instance, Leola supports the logic of Motho ke Motho ka Batho in various ways, beyond collecting and distributing funds. This includes sharing elders' advice, identifying challenges affecting different parts of the community, determining solutions and coordinating to address them, networking and liaising with authorities and other institutions. Analysis of the details of Leola enabled mapping local logics and relations and prompt inhabitants to reflect on how these are affected by societal changes.

Exploring the efficacies of a locally innovated and evolving system, such as Leola, and the ways technology can support and improve it, offers resources for negotiating what digital transformation should mean locally. For instance, discussions in Mamaila raised concerns about how elders' oversight can, on the one hand, protect Leola from consumerism and potential scamming but, on the other, exclude youth and reproduce patriarchal power. Intergenerational knowledge is vital to cultural identity; however, digital systems tend to be biased towards communication practices that reinforce differentiations in sharing information between older and younger people [15]. Locating design endeavours within a rural CN can offer, however, particular opportunities to tackle such tensions in digital transformation. For instance, Mamaila Community Network can develop programming skills amongst youth, and in the future children, while involving parents and elders with limited digital literacy. Importantly,

the infrastructure of a rural CN, provides the land in which to do Mandhwane. Unconstrained by the expense of commercial telecommunications, inhabitants can adapt their processes and create services according to their own temporal spatial scales, and control and make meaning from the data they generate themselves.

7 Acknowledgements

8 References

1   Adamu, S.M. Rethinking Technology Design and Deployment in Africa: Lessons from an African Standpoint. In Proceedings of 3rd African Human-Computer Interaction Conference: Inclusiveness and Empowerment (AfriCHI'21) 75-83. ACM (2021)

2   Adeyemi, M.B., Adeyinka, A.A. Some key issues in African traditional education. McGill Journal of Education, 37, 223-240. (2002)

3   Aludhilu, H.N., Bidwell, N.J. Home is not Egumbo: Language, Identity and Web Design. In Proceedings of the 2nd African Conference for Human Computer Interaction (AfriCHI'18). ACM (2018)

4   Association for Progressive Communications. Global Information Society Watch: Community Networks. APC (2018)
    www.apc.org/en/pubs/global-information-society-watch-2018-community-networks

5   Avle, S., Lindtner, S. Design (ing) 'Here' and 'There': Tech Entrepreneurs, Global Markets, and Reflexivity in Design Processes. In Proceedings of the 34th Conference on Human Factors in Computing Systems. (CHI'16). 2233-2245. ACM (2016)

6   Avle, S., Lindtner, S. Williams, K. How Methods Make Designers. In Proceedings of the 35th Conference on Human Factors in Computing Systems (CHI'17) 472–483. ACM (2017)

7   Awori, K., Bidwell, N.J., Shewarga-Hussen, T., Gill, Lindtner, S. Decolonising Technology Design Panel. In Proceedings of the 1st African Conference for Human Computer Interaction (AfriCHI'16). ACM (2016)

8   Baiphethi, M., Hart, T. Tshepo Khumbane. Growing South Africa's women and landscape. Agenda: Empowering women for gender equity 22(78):156-162. Taylor and Francis (2008)

9   Bidwell, N.J. Decolonising HCI and Interaction Design Discourse: Some considerations in planning AfriCHI. XRDS 22 (4) 25 -30. ACM (2016)

10 Bidwell, N.J. Moving the centre to design social media for rural Africa. AI&Soc: Journal of Culture, Communication & Knowledge 31(1) 51–77. (2016)

11 Bidwell, N.J. Women and the Spatial Politics of Community Networks: Invisible in the sociotechnical imaginary of wireless connectivity. In Proceedings of the 31st Australian Conference on Human-Computer-Interaction: 197-208 (2019)

12 Bidwell, N.J. Decolonising in the gaps: Community Networks and the identity of African innovation. In H. Dunn (editor) Media, Culture and Technology in the Global South: Reimagining Communication and Identity in Africa and the Caribbean. Palgrave (2021)

13   Bidwell, N.J., Reitmaier, T., Rey-Moreno, C., Roro, Z., Siya, M., Dlutu, D. Timely relations in rural Africa. In Proceedings of the 12th International Conference on Social Implications of Computers in Developing Countries. The International Federation for Information Processing (IFIP) WG 9.4: 92 -106. Springer (2013)

14   Bidwell, N.J., Reitmaier, T., Jampo, K. Orality, gender and social audio in rural Africa Proceedings of the 11th International Conference on the Design of Cooperative Systems (COOP) (2014)

15   Bidwell, N.J. Robinson, S., Vartiainen, E., Jones, M., Siya, M., Reitmaier, T., Marsden, G., Lalmas, M. Designing social media for community information sharing in rural South Africa. In Proceedings of the Southern African Institute for Computer Scientist and Information Technologists Annual Conference (SAICSIT). ACM (2014)

16   Bidwell, N.J., Winschiers-Theophilus, H. Extending Connections Between Land and People Digitally. Heritage and Social Media: Understanding heritage in a participatory culture. Routledge (2012)

17   Chilisa, B., Major, T.E., Gaotlhobogwe, M., Mokgolodi, H. Decolonizing and indigenizing evaluation practice in Africa: Toward African relational evaluation approaches. Canadian Journal of Program Evaluation, 30(3) (2015)

18   Csikszentmihalyi, C., Mukundane, J., Rodrigues, G.F., DMwesigwa, D., Kasprzak, K. The Space of Possibilities: Political Economies of Technology Innovation in Sub- Saharan Africa. In Proceedings of the 36th Conference on Human Factors in Computing Systems (CHI'18). ACM (2018)

19   Daswa, T.J., Matshidze P.E., Netshandama, V.O., Makhanikhe, T.J., Kugara S.L. Mahundwane: an educational game for Vhavenda Youth. Gender and Behaviour, 16 (2), 11623-11637 (2018).

20   De Lange, M., Kruger, E., Stimie, C.M. Water harvesting for home food security. The International Journal of Rural Development, 4, 26-29 (2009).

21   Diallo, D.D. The Sankofa Paradox: Why Black Women Know the HIV Epidemic Ends With "WE". (2021)

22   Edozie, R.K.. *"Pan" Africa Rising: The Cultural Political Economy of Nigeria's Afri-Capitalism and South Africa's Ubuntu Business*. Springer (2017).

23   Gill, A.Q., Chew, E. Configuration information system architecture: Insights from applied action design research, Information & Management, 56(4) 507-525 (2019)

24   Gina, B. Presenting and Re-presenting the Past: African Childhood recalled. Tydskrif vir Nederlands & Afrikaans 10 de Jaargang (2) (2003)

25   Gwaka, L.T., May, J., & Tucker, W. Towards low-cost community networks in rural communities: The impact of context using the case study of Beitbridge, Zimbabwe. The Electronic Journal of Information Systems in Developing Countries, 84(3) e12029 (2018).

26   Heeks, R. From Digital Divide to Digital Justice in the Global South: Conceptualising Adverse Digital Incorporation. In Proceedings of the 1st IFIP 9.4 Virtual Conference. (2021).

27   Heeks, R. ICT4D 2.0: The next phase of applying ICT for international development. Computer 41(6): 26-33 (2008)

28   Ho, M.R., Smyth, T.N., Kam, M., Dearden, A. Human-computer interaction for development: The past, present, and future. Information Technologies & International Development 5(4) 1. (2009)

29   Irani, L. Design thinking: Defending Silicon Valley at the apex of global labor hierarchies. Catalyst: Feminism, Theory, Technoscience, 4(1) 1-19 (2018)

30 Itchuaqiyaq, C.U., Breeanne M. Decolonizing decoloniality: considering the (mis)use of decolonial frameworks in TPC scholarship. Communication Design Quarterly 9(1). ACM (2021)

31 Kanstrup, A.M., Christiansen, E., Model power: still an issue? In Proceedings of the 4th Decennial conference on Critical computing: between sense and sensibility 165-168. (2005)

32 Krige, E.J., Krige, J.D. The realm of a rain-queen: A study of the pattern of Lovedu society. Routledge (2018)

33 Kurland, R., Salmon, R. Group work vs. casework in a group: Principles and implications for teaching and practice. Social Work with Groups 28(3-4) 121-132. (2005)

34 Lazem, S., Giglitto, D., Nkwo, M.S., Mthoko, H., Upani, J., Peters, A. Challenges and paradoxes in decolonising HCI: A critical discussion. Computer Supported Cooperative Work (CSCW) 1-38. (2021)

35 Magoro, K.D. Digital Mandhwane Driving community networks to connect the unconnected in developing regions for inclusive growth: AN IITPSA #IFIP60 Event, 17 November. https://event.webinarjam.com/register/77/plp6kh45 (2021)

36 Magoro, K.D. Cultural knowledge systems, Mandhwane and Mind Mobilisation for rural communities in the digital era. In Proceedings of the International Conference of the Digital Humanities Association of Southern Africa. https://dh2021.digitalhumanities.org.za/home/proceedings-and-book-of-abstracts/ (2021)

37 Magoro, K.D. Social capital and people centred approach. The 10th Virtual African Internet Governance Forum (vAfiGF2021). https://2021.afigf.africa/ (2021)

38 Makaudze, G. Africana Womanism and Shona children's Games. The Journal of Pan African Studies. 6(10): 129-140. (2014)

39 Makaudze, G. African traditional leadership and succession in the post-colonial Shona novel. Southern Peace Review-Journal 5(1):9-19. (2017)

40 Mamaila Community App download: https://play.google.com/store/apps/details?id=com.ree.mizer.communityapp&hl=en_ZA&gl=US

41 Mashiba, M., Asino, T. Afrikan Pedagogy & Technology-Supported Learning. In At the Intersection of Indigenous and Traditional Knowledge and Technology Design. N.J. Bidwell, and H. Winschiers-Theophilus (editors). (2015)

42 Mateus, S., Mufeti, T., Bidwell, N.J. Social network platforms and the oshiwambo practice of eengano. In J. Halberstadt, J. Marx Gomez, J. Greyling, T.K. Mufeti (editors). Resilience, Entrepreneurship and ICT. Latest Research from Germany, South Africa, Mozambique and Namibia. CSR, Sustainability, Ethics & Governance (2021)

43 Mbembe, A. Democracy as a community of life. In J.W. De Gruchy (editor) The humanist imperative in South Africa (pp. 187–192). Stellenbosch: Sun Press (2011)

44 Molehe, R.C., Marumo, P.O., Motswaledi, T.R. The position of womanism versus feminism in a contemporary world: the African philosophy perspective. Gender & Behaviour 18(4). (2020)

45 Motshekga, M. K. The Mujadji Dynasty: The principles of female leadership in African cosmology. M. Emond (editor). Kara Books (2010)

46 Mutema, F. Shona Traditional Children's Games and Songs as a Form of Indigenous Knowledge: An Endangered Genre. IOSR Journal of Humanities and Social Science 15, 59-64. (2013)

47 Pendse S.R., Nkemelu D., Bidwell N.J, Jadhav S., Pathare S., De Choudhury M., Kumar, N., From Treatment to Healing: Envisioning a Decolonial Digital Mental Health. In Proceedings of the 39th Conference on Human Factors in Computing Systems (CHI'22). ACM (2022)

48 Phokeer, A., Hadzic, S., Nitschke, E., Van Zyl, A., Johnson, D., Densmore, M., Chavula, J. iNethi Community Network: A first look at local and Internet traffic usage. In Proceedings of the 3rd Conference on Computing and Sustainable Societies (COMPASS'20) 342-344. ACM (2020)

49 Rey-Moreno, C., Pather, S. Advancing Rural Connectivity in South Africa through Policy and Regulation: A Case for Community Networks. In IST-Africa Conference 1-10. IEEE (2020)

50 Rich, M.J, Pather, S. A response to the persistent digital divide: Critical components of a community network ecosystem. Information Development (2020)

51 Sanoff, H. Multiple views of participatory design. Focus, 8(1)7. (2011)

52 Sen, A. Commodities and capabilities. Oxford University Press (1999)

53 Siochrú, S., Girard, B. Community-based Networks and Innovative Technologies. United Nations Development Programme (2005)

54 Smith, C.R., Winschiers-Theophilus, H., Kambunga, A.P., Krishnamurthy, S. Decolonizing participatory design: Memory making in Namibia In Proceedings of the 16th Participatory Design Conference 2020-Participation (s) Otherwise-(1) 96-106. (2020)

55 Spivak, G.C. Translation as culture. Parallax, 6(1) 13-24. (2000)

56 Tarisayi, K.S., Manhibi, R. Infancy of internet cafe: the substitute of Ubuntu-padare pedagogy. Indilinga African Journal of Indigenous Knowledge Systems, 16(1), 63-72. (2017)

57 Tatira, B., Mutambara, L.H.N., Chagwiza, C.J. The Balobedu Cultural Activities and Plays Pertinent to Primary School Mathematics Learning. International Education Studies 5(1) 78-85. (2012)

58 The Internet Society. African Community Networks Summit. https://www.internetsociety.org/events/summit-community-networks-africa

59 Toyama, K. Geek heresy: Rescuing social change from the cult of technology. New York: Public Affairs (2015)

60 Tuck, E., Yang, K.W. Decolonization is not a metaphor. Decolonization: Indigeneity, Education & Society, 1(1). (2012)

61 Twinomurinzi, H., Phahlamohlaka, J., Byrne, E. Diffusing the Ubuntu philosophy into e-government: a South African perspective. In E-government, E-services and global processes. 94-107. Springer (2010)

62 Van Stam, G. Method of research in a we-paradigm, lessons on living research in Africa. In Proceedings of the 18th International Conference on Social Implications of Computers in Developing Countries. The International Federation for Information Processing (IFIP) 72-82. Springer (2019)

63 Van Vuuren, L. Mma Tshepo-celebrating a life dedicated to water. Water Wheel 9(3): 34-35. (2010)