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Abstract. This paper presents a transdisciplinary eHealth narrative as it appears to health professionals, information and communication technology experts, and health practitioners in Zimbabwe. Harvesting from rich experiences and focus group discussions, the embedded authors present how various traditions position eHealth. Reflecting upon the genesis of the multiple perspectives – anthropological, computer science, medical, among others – this paper presents a practice of eHealth in Zimbabwe. The paper serves as a rationale for aligning eHealth with people, processes, systems and categorisations that consider the local cultures, the local way of meaning-making, and value local systems.

Keywords: eHealth, development, Africa

1   eHealth

The World Health Organisation [1] defines eHealth as "the cost-effective and secure use of ICT in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research." eHealth is seen as crucial in achieving universal health coverage by 2030 as outlined in Sustainable Development Goal #3. In contemporary practices, eHealth comprises of rapidly developing and decentralised client-provider forms of health care provisioning based on facilities emerging from ubiquitous information and communication technologies (ICT) and the increasing mobility of people and resources. Further, eHealth enhances the accessibility of clinical data for decision making by health professionals at all levels and facilitates the visibility of information as feedback for continuous health improvement in communities, by individuals, and in the health systems.

The growth of connectivity, devices, and platforms has a direct effect on the available channels of communication and information. The pervasiveness of ICT impacts all aspects of life, including healthcare and the prevention of disease, through new opportunities for information exchange between health clients and health providers. The richness of information flows is enhanced by graphical tagging through Geographical Information Systems (GIS) and by crowdsourcing [2]. eHealth, therefore, represents a field that is to be conceptualised not as subservient to current

forms of health care, but as an integral part of such a care. eHealth does not necessarily replace the 'older systems' of health care provisioning. Instead, it gives scalability and ability to additional forms of health care and, thus, overlays and coexists with it. Advanced information technology and the integration of information systems through telecommunication networks and services, including Internet applications, are used to increase operational efficiency, efficiencies in decision-making processes, and management effectiveness [3]. Therefore, eHealth is a horizontal contemporary to the current means of health management and supports health and health care provisioning, operating in the same space. eHealth, however, changes the space as it questions of the spatiality (the reach) of local practices in health. Therefore, eHealth thrives on inputs from social, cultural, health, and information systems. It opens up both exciting opportunities and real threats to the central features of contemporary health management in Africa. eHealth challenges the spatialisation of the (local) health institute and the encompassing role of national health governance. ICTs, through their global nature, alter or bridge spatial imaginaries [4]. Due to new communication possibilities, improved information flows breach long-established spatial and scalar ways of health management and healthcare provisioning. Therefore, eHealth represents opportunities and challenges for the established practices in both public and private health management and healthcare systems.

New manifestations of health provisioning, 'the trans-nationalisation of the local' through the employing ICTs, raise political and epistemically issues as to their cultural and moral fit. Also, services emerge that compete with those provided for at the local health institute. In many parts of Africa, these kinds of developments are in their early conceptualisations and review. As in Africa less than a quarter of the population is using facilities provided for through Internet, eHealth is still to go beyond the stage of sensitisation, testing, amending and small-scale implementation, into ubiquitous availability and operation. Evidence as to how eHealth can enhance the wellbeing of the disenfranchised, or potentially brings harm by changing the health management and care landscape, is still meagre in most parts of Africa. However, the growing precariousness of the position of current actors in the contemporary manifestation of changes in health care systems within institutions, in social systems, and in societies need academic scrutiny, regulatory oversight, professionally executed programmes, case-building and the development of African models. Unfortunately, scientific models sensitive to the African contexts and cultures are scarce. Therefore, with this paper, we seek to introduce eHealth from an African context.

2   Methodology

The object of this paper is an introduction to perceptions of eHealth in Zimbabwe, setting the context for the development of African models and theories to be wrestled from a non-African hegemony. Our research utilised living research [5]. We reflected upon our experiences of implementing and reviewing eHealth and related activities in

Zimbabwe and Zambia over the last 15 years. Our experience encompasses research in development studies, computer science, medicine, and culture studies respectively. During 2017 and 2018, the co-authors presented the outcomes of their experiences and reflections during focus group discussions at Technical Working Group meetings at Zimbabwe's Ministry of Health and Child Care (MoHCC) and at national and international meetings, upon their requests. The intersection of the lived experiences, and a quest with, in, and for theory allows participation while observing [6].

3   eHealth as a Multi-episteme in Africa

eHealth is multi-faceted and can be approached from various methodological and conceptual angles. Trans-disciplinarity gives a pertinent voice to practitioners involved in the actual field of implementation and use of eHealth. Our area of review is the whole of Zimbabwe, while we review cases in Masvingo Province.

Geopolitically, eHealth seems to be firmly established in a foreign narrative of the 4th industrial revolution, where anticipated internet of services and internet of things are expected to fuel further industrialisation and economic growth, as well as human capacity development [7]. The data revolution that is instrumental for eHealth, ushers forth predictive healthcare, where international – often North-America based – platforms and institutions aim to predict health challenges upon aggregated data [8]. Such development, potentially, reduces Africans (again) as hunters and gatherers of raw data, as native informants who collect and provide empirical data from their areas for external processing in West [9].

In general, the realisation of the promises of eHealth appears to be a distant reality in Africa in 2019, both in temporal and spatial practices. Some islands of activities do exist, mainly in urban conglomerates and countries with relatively high penetration of mobile networks and tools, like Kenya, South Africa, Ghana and Rwanda. However, in other countries, like Zimbabwe, eHealth remains disunited, with fragmented and distant pockets of activities in society and socio-technical systems.

eHealth came as an autonomic arousal process in the wake of international non-governmental organisations (INGO) operating in the African space. Oxfam's report on digital development [10] shows that a significant majority of development specialists see the development sector (including health) 'going digital'. However, they regard INGOs being unengaged with the advances in ICT. This verdict is troubling as, in the health sectors in Africa, INGOs are crucial resource partners in national health programs. Therefore, there appears a unhingedness of contemporary approaches and the resource challenges that affect the use of ICT in many African government ministries. As a result, the most disenfranchised populace in African places, like those in rural areas, risk being left out of eHealth opportunities.

4   The Emerging Materialisation of eHealth in Zimbabwe

The Zimbabwe ICT Policy Framework for MoHCC, states that "ICT has the potential to impact upon almost every aspect of the health sector. In public health, health

information management and communication processes are pivotal and are facilitated or limited by the available information and communication technology". The National Health Strategy (2016-2020) states that "The hospital information systems need to be harmonised and fully computerised with all departments, equipment and patient flow properly linked electronically." [11] An eHealth strategy has been in the making for several years, guided through technical support by the WHO eHealth strategy development toolkit supported by the International Telecommunications Union (ITU).

In the MoHCC, a variety of initiatives could be gathered under the denominator 'eHealth' or 'digital health'. As these are nationwide initiatives, most of them are at the platform level. In Zimbabwe, like many other African countries, the MoHCC is heavily reliant on funding from external partners, mostly sourcing from outside the country. As a result, the architecture and functionalities of eHealth platforms are influenced by organisations from the outside, often through the method of technical assistance.

The MoHCC operates three nation-wide main electronic health information platforms and some specific care related platforms. The main ones are the electronic Patient Management System (ePMS) for HIV related patient-level care and the Zimbabwe health information system (a national rendering of the District Health Information System (DHIS2)) reporting aggregated information. The third one is an eGovernment initiative, connecting all government ministries to the Ministry of Finance and Economic Development, called the Public Finance Management System (PFMS). Example of a specific care related platform is the Laboratory Information Management System (LIMS/LIS) for viral load testing. All platforms reside upon computer systems located within the premises of the government of Zimbabwe. They feature stringent data security and access measures to secure the integrity of the data.

Additionally, the MoHCC is involved in various experiments and projects, like the development and piloting of an Electronic Health Record (EHR) system. Further developments include an application for e-partograph, the piloting of telehealth in Manicaland province, the notification of maternal deaths, the implementation of blended learning and the monitoring of clinical mentoring, among others. Each of these developments is undertaken with a variety of partners (e.g. Global Fund, CDC, SolidarMed, and the World Bank). INGOs in health in Zimbabwe mostly focus on HIV/AIDS and maternal, neonatal and child-health plus the adolescents (MNCH+A). These organisations run a variety of national and international platforms, using different setups. A few organisations use dedicated computers and software located in Zimbabwe. Many organisations, however, appear to utilise platforms residing in other countries, outside of the control of the Government of Zimbabwe. In general, most ICT activities take place without the active involvement of eHealth experts from government ministries, and, therefore, without local capacity building or transfer of data, knowledge, and skills.

Due to the many possible angles with which eHealth can be approached, in practice, multiple players and local, regional and international powers strive to take control of tools, platforms, and, most importantly, the data that these platforms contain. Struggles on 'where to manage eHealth' are particularly rampant in spheres where colonial and 'old era' organisational structures have remained. From these

long-term embedded structures, the multiverse of eHealth varies from different angles, as will be shown below.

4.1   eHealth as the backbone of health systems

eHealth as the (future) backbone of the health system sees technology as a tool for prevention and management of disease with the aim of epidemiological control [12, 13]. The National Health Strategy (NHS) of Zimbabwe gives ample evidence for the adoption of this view when it states "Significant investments in health system strengthening are necessary for the health facilities and other service delivery and coordination platforms to function optimally" [11]. Further, the NHS states an objective to drive the production of key health indicators by using ICT platforms.

4.2   eHealth as a measurement and evaluation of health service delivery

In this perspective, eHealth is seen as a necessary and instrumental part of the statistical and administrative enterprise, for the respective, real-time and prospective monitoring and evaluation of health developments, to inform health programs and their (potential) outcomes [14].

4.3   eHealth as a network of tools, platforms, and applications

In this view, eHealth is regarded as a network of technologies, requiring attention from technology inclined departments, or from technologically dedicated ministries (e.g., the Ministry of ICT). In a narrative leaning towards technology determination, eLearning and the dissemination of guidelines using Information and Communication Technologies is positioned as to take the health industry by storm.

4.4   eHealth in the private sector

In Zimbabwe, the most prominent component of health care is provided through the MoHCC. Private business and clinics serve the remaining populace, focusing mainly on the well-to-do and urban people. Private health providers do have obligations to report to the government. In practice, they rely on information systems sourced from private industries that do not necessarily interface with the information systems in the MoHCC. A variety of commercial initiatives are available, with mobile operators, hardware (like IBM), and software (like SAP) providers yielding significant influence. For instance, mobile operators provide health messages and operate systems for mobile money transfer and the facilitation of remittances from the diaspora [15].

5   eHealth and ICT in Zimbabwe

When exploring the role of information and communication technologies (ICTs) in eHealth and considering the definition of eHealth by the WHO as cited at the start of this paper, we have tried to narrow the field down by categorising ICTs in *tools* and *platforms*. In this view, mobile phones and other devices are seen as *tools* like a

multipurpose equivalent to a Swiss knife, being separated from the transfer, storage and processing of the data in third-party service *platforms*.

We analysed the documents and presentations offered during continuous education meetings and conferences organised by medical associations, monthly UNICEF's brown bag meetings, and presentations on eHealth at the Computer Society of Zimbabwe, over the last two years. From these, we deduced the main subjects discussed under the banner eHealth. These are: applications in eLearning (focussing on health professionals), electronic health records, big data analysis, and telemedicine. To a lesser extent, aspirational narratives feature the potential of artificial intelligence, the internet of things, and robotics with little to show in daily Zimbabwean practice yet.

5.1   An Anthropological Perspective

eHealth can be approached as to how underserved individuals and communities engage with its existence in the form of tools and platforms. From practices in eHealth within Masvingo Province, Zimbabwe [16], sensitised by the work of Haikin and Flatters [10], we deduce the following prerequisites for ICT employment for eHealth in Zimbabwe.

- *Enable Connectivity and Access*: Network constraints and access barriers suppress the local voices, knowledge and inclusion.
- *Involve Transdisciplinarity*: Multiple, complementary approaches towards society and technologies are necessary to reconcile an abstract international discourse – regimes of non-locally derived 'truth' – with the African experience.
- *Value Local*: Many avenues are reported, but most appear not to consider local context, vocabulary, access realities, sensitivities and taboos, and for local inclusion and agency considering the sociology of ubuntu/unhu.
- *Think Local*: Activating local meaning, content, relevance and production of systems is critical for enmeshed end-users and stakeholders and gaining a shared, embodied knowledge base.
- *Put the lead local*: Iterative programmes led by and involving actual end-users and guided by 'local talents' produce embedded solutions and applications.
- *Scaling is hard*: Depends on socialites, geopolitics, usability, affordability and common understanding and necessitate diversity.
- *Embed development in ambient culture*: Holistic and efficient development involves sharing of resources and opportunities as well as giving equal opportunities to both women and men.

These non-exhaustive prerequisites are a focus in the private sector, which, naturally, is inclined to align with local realities. However, possibly due to the dominant guidance from players from outside Zimbabwe, these prerequisites seem less guiding in the daily practice within the MoHCC.

5.2   A Computer Science Perspective

In the natural sciences, technological development is related to the creation of a 'modern society', aligned with ideological constructs from outside Africa [17].

Computer scientists and engineers are the builders of infrastructure, industrial and mechanised production, modern transportation systems, and technological innovations such as mass media, computers and communication systems. Often, in a one-dimensional view, technological interventions are positioned as determining essential outcomes [18, 19]. Gomez and Pather [20] show how such a view of technology determination are in need of a critique of its paradigmatic foundation. This view coincides with Dourish and Mainwaring [21] observation of the colonial bias in ubiquitous computing. In Zimbabwe, testing of blended learning solutions includes social interactions and computer-aided provisioning of study materials. These are signs of the possibility of contextualised bridging of socio-technical divides [22].

5.3   A Medical Science Perspective

In this perspective, 'quality of care' involves issues of workload and contextual practicalities in the contact between the health client and the health practitioner [23]. In its assessment of the diffusion of eHealth at a global scale, the WHO [24] states that universal health coverage cannot be achieved without the support of eHealth. Further, the WHO research indicates that eHealth supports interoperability of people-centred health services, moving practices from disease-silos to resilient health systems.

5.4   A Data Science Perspective

eHealth is the rendering of data from mission-critical medical operations to garner evidence that focuses attention and resources in a particular direction. This perspective is primarily concerned with harvesting and processing of data, regarding it a resource comparable to other precious resources like oil. Data Science propels eHealth into the non-African concept of the 4th industrial revolution where everything hinges around harvesting and processing of data from a universal interconnectedness. An important and contentious area of development is the generation and use of big data to provide health predictions [8]. The onslaught of data leakage and political influencing, enabled by the borderless exchange of information, is putting African governments in difficulties. The scientific basis set in a negotiation of subalternised local and dominant international experiences and epistemes is not yet balanced. Countries are scrambling to react, doing so differently. For instance, Tanzania has put severe restrictions on the transfer of information from its state [25], Zambia has adopted its own home-grown EHR (SmartCare), and Zimbabwe implemented a Ministry of Cyber Security.

5.5   A Political Science Perspective

Zimbabwe's government implements its projects in the geopolitical realities of INGOs and international policies. An example is the blueprint for Zimbabwe's economy, Zimasset [26], in which the government painted a moral imperative: the focus of the development of the country according to its terms. However, the direction of (monetary) benefits of the global information society remains one-sided as the architecture of the internet maps disturbingly well with the global information society that was created (by shipping) in the 16th and 17th century [27]. The big question is

how African governments and health institutions can benefit from its national data resources. Beneficiation of resources (among which is the healthcare data), is needed to be done 'in country' to ensure the creation of embodied knowledge in all aspects of eHealth [28]. Through the central management of its data platforms, the MoHCC controls which data can be accessed by whom. In political manoeuvring, stringent access rules are being used as an excuse by some INGOs to launch their parallel eHealth setups which collect data in parallel to the government systems, directly from health facilities in acts of defiance.

5.6   An Economic Perspective

eHealth helps to lessen the workload in health care through the elimination of costly paper registers that are difficult to procure and maintain. Although there are apparent benefits of using paper registers in resource-limited settings – and their phase-out is not yet eminent – they do not allow for easy linkage of data [29]. Through eHealth, hybrid formats of national data can be managed and be readily available and accessed by authorised (partner) organisations. However, local communities do not have the resource to purchase nor maintain capital-intensive equipment and, therefore, are subject to the whims of the (foreign) financiers and their perspectives. Thus, the implementation of eHealth can result in local exposure to geopolitical meddling of, for instance, the aid-industry. Foreign notions of eHealth are not embedded aligned with Africa's relatio-economy, with its precepts of sharing and giving. The beneficiation of local data gives rise to regional markets of constructive engagement, for instance by coupling healthcare processes with remittances [15].

5.7   A Practitioners Perspectives

Trans-disciplinarity includes the various practitioners involved in the actual implementation and use of eHealth. These practitioners include health experts, computer scientists, ICT engineers and others. Johnson *et al.* [30] have argued that ICT practitioners are facing environmental, skills and cultural challenges. They often handle technologies that are unaligned with local contexts [31]. Due to the geography of African countries like Zimbabwe and the challenges of travelling, the focus of developmental attention is often limited to urban areas. Therefore, deep-rural areas lack attention. Rural realities remain less understood, with interventions being managed 'from the centre' creating barriers for local capacity building. In the meantime, computer literacy remains a challenge, with health staff having little exposure to, and experience with, ICTs [32]. Lastly, the discordance of local means of gaining embodied knowledge and the top-down manner of introduction of eHealth interventions disempower practitioners in fully engaging the community.

6   Discussion

Literature and narratives on eHealth appear to be originating from a well-resourced, western, individualistic epistemology [18, 33]. To ensure *access* to eHealth, to both contextually sound platforms and tools, the MoHCC recognised the continuous

processes of community engagement (focused on reaching collective potential), workforce development (to inspire local talent), and thought leadership (to ensure respectful representation). In the development of eHealth in rural areas, the Masvingo based INGO SolidarMed operates an iterative, inclusive eHealth development process through a monthly Hackathon and daily eHealth lab activities [16, 34]. In a hackathon process, every month ICT professionals and health experts mingle in a transdisciplinary and voluntary design event. During the events, computer programmers and vocational experts involved in software development, together with health subject-matter-experts, collaborate voluntarily and intensively on projects. Their collective goal is to create usable technologies, applications and services. This engagement aligns with the renderings of the communal values of ubuntu (providing moral grounds in communal love), oratio (communicating embodied knowledge), relatio (relational resource allocation), animatio (continuous present moment), and dominio (striving for maturity) [35].

eHealth developments are context sensitive and must take into account the practices of paradigm switching (between the I, we, and it-paradigms), and the presence and subconscious agency of the Terrible Three, being orientalism, imperialism, and colonialism [35]. Further, eHealth in African settings should be sensitive to the technical realities that influence technical performances due to latency, congestion, and the vast variety of technologies, tools, platforms, and applications. Although ICTs appear enthralling, they harbour real difficulties and fuel inequalities [36]. Among them is the capabilities and disempowerment of 'the haves and the haves not'. Those with equipment 'have', those without 'not'. Those with electricity 'have', those without 'not', and those with 'good' connectivity 'have', those without 'not'. Connectivity and ICTs, and thus eHealth, are unequally distributed. The issues hampering access to communication networks are highly complex while mobile networks are not necessarily reliable in rural areas. Geopolitics and platforms from the West are playing a predominant role [37]. In this hegemony, the development and maintaining of national, African data platforms are being crowded out. In the meantime, equipment is varied and might not be patched in time and thus have security issues [38].

New technologies can lead to new dependencies. These dependencies include having to align with people, processes, systems and categorisations that not necessarily respectful or considerate to local cultures and the local way of meaning-making [18]. Further, foreign involvement involves foreign payments depleting foreign currency reserves. In settings with imported technologies, training is mostly done off location, involving disproportional travel and logistical expenses. Of course, development partners are bound to pursue their agenda, for their organisations and themselves, rather than for the people that they claim to serve [17, 39]. Therefore, the support of technical assistants in eHealth is not necessarily aligned with the needs of the country. This misalignment, again, can lead to dependencies on foreign organisations and persons. In the meantime, national research and development remain underfunded and uninvolved. As shown, the attention for data security is mounting, however, through data breaches that circumvent sovereignties, foreign researchers can assess information and deduce knowledge out of context [33].

Instantiations of eHealth seem connected to coloniality that places peoples and knowledge in systems of thought that strengthen Eurocentric meaning making [5]. However, there is a need for epistemic diversity to envision social life, knowledge and technology in Africa, providing for cognitive justice of African experience [40]. From our experience, there is much room for the deconstructing of to which knowledge and power structures eHealth are linked and a reconstruction of knowledge that acknowledges the agency of African people and groups. Therefore, there might well be contrapuntal developments in eHealth, with different paths in a globalised society that show differentiated pathways to the aim of quality health provisioning.

7   Conclusion

In this paper, we show that eHealth is part of a digital infrastructure that is increasingly becoming all-pervasive in the global society and human life. Though our work on eHealth is situated in Zimbabwe, the deductions offered could resonate with other African settings where eHealth projects are being deployed, providing a platform that can be further built upon by more vertical research. We argue for the primacy of the local episteme in eHealth.

eHealth is connected to a dramatic expansion in the production and use of large amounts of data with a potential of bypassing local and even national policies. eHealth development, therefore, needs careful, contextual guidance as for how to ensure data integrity and that information management and knowledge generate local benefits and empower local communities of practice.

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