







Developing a Digital Information and Consultation Platform in Zimbabwe

Trymore Chawurura¹, Shepherd Chikomo², Ronald Manhibi³ , Janneke van Dijk³ ,
and Gertjan van Stam³  

¹ Ministry of Health and Child Care, Harare, Zimbabwe

² Total IT, Harare, Zimbabwe

³ SolidarMed, Masvingo, Zimbabwe
gertjan@vanstam.net

Abstract. This paper presents a narrative on developing a COVID-19 digital information and consultation platform for a province situated in southern Zimbabwe. In response to a WHO prediction and call to prepare for the worst, a team of medical and computer experts worked on a sovereign digital platform facilitating COVID-19 triaging over the phone. Ethnographic assessments revealed that platform developments benefitted from national dialogue, engaged communities and stakeholders, and use of locally available technologies and skills. In this paper, the development of this digital platform is placed in the broader facets of local development, data sovereignty, and growth of local capacity and abilities under the auspices of the Zimbabwe Ministry of Health and Child Care. The paper reflects on the facets involved in developing this digital platform for digital health interventions aligned with local capacity and needs.

Keywords: COVID-19 · Triage · Contact centre

1 Introduction

Digital platforms from the USA and China dominate platform economies [1]. However, in public health, the use of foreign, privately-owned digital platforms is at odds with the functions of a health system, especially in providing appropriate and secure venues for health care for all [2]. In addition, the issues of data sovereignty are becoming topical for Ministries of Health [3]. This paper narrates the development of a government-owned Digital Information and Consultation Platform (DICP) for a COVID-19 response in Zimbabwe, discerning a process that is cognisant of macro-political circumstances and local agency.

Authors in alphabetical order.

2 Method

This retrospective paper is drawn up by authors who participated transdisciplinarily from the moment of the DICP conception, its design and development, and its training and operational phases. Dynamic and integrative epistemological routes frame the work to integrate long-term, diverse and differentiated experiences, embodied understandings, value judgements, and actions [4, 5]. Such complexities call for contextual and suitable analytical routes and theoretical strands, which were derived from the social sciences [6]. The authors utilised ethnographic immersion. Longitudinal observations, experiences, and learnings were harmonised in a literature review of the Zimbabwean context and experiences from call centres in Africa. The explicit aim was to recognise patterns and wrestle local understanding from under a Eurocentric gaze as an act of decolonisation [7]. Based upon the processing of multiple layers of observations and evaluation, the paper discusses decentered, inclusive, multifaceted approaches that emancipate polyvocality (the consideration of many voices), diversity and multiple perspectives, with a preference for African positionalities [8].

3 Sequence of Events and Their Grounding in Theory

In March 2020, in response to the COVID-19 pandemic, the World Health Organization (WHO) signalled that Africa should prepare for the worst [9]. The projected worst-case scenario was a high prevalence of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in an overwhelmed public health system. Immediately, the Zimbabwean Ministry of Health and Child Care (MoHCC) consulted its network of Digital Health specialists. The eHealth team of SolidarMed Zimbabwe – a Masvingo based private voluntary organisation – together with the Masvingo Hackathon [10] responded and developed participatory development plans for an African, sovereign digital health platform to sustain context-appropriate services interventions. The proposed digital health response was geared towards supporting and strengthening the Zimbabwean health system during the COVID-19 pandemic, taking into account the Zimbabwean context for digital health [11], its desire for data sovereignty [3], and experiences in developing digital health service platforms in Zimbabwe, for Zimbabwe, by Zimbabweans [12]. Subsequent developments took place under close supervision and guidance of the MoHCC. The aim was to develop a digital health intervention that allowed for the continuation of access to health information and care if the worst-case scenario described by the WHO would happen.

From the outset of the COVID-19 pandemic, the Government of Zimbabwe urged medical professionals to switch to digital health interventions. Developing a ‘contact centre’ to support the health system was conceptualised as an innovative way of heeding this call. From previous work [13, 14], the research and development teams were aware that decentered, inclusive engagement of all stake- and relationholders is crucial for shared ownership and the embedding of local know-how [15]. This sensitivity to context is in line with the argument of Philip Alston, the United Nations’ special rapporteur on extreme poverty and human rights, who wrote that the protection of human rights when using technology depends on the level of its co-development [16]. This co-development

includes the unlocking of embodied knowledge [17] and the depth of local engagement in underlying the processes that form the system [18]. Due to lockdowns to counter the COVID-19 pandemic, engagement processes materialised through regular interaction via communication platforms like Skype, WhatsApp, and Zoom.

From his observations and lessons learned from years of ICT development projects, Tim Unwin, the UNESCO Chair in Information and Communication Technology for Development (ICT4D), offered the following priorities in developing digital platforms and interventions [19]:

- ensure that there is no duplication of efforts
- regard privacy and security carefully
- ensure no detraction from official information
- keep it simple and support and use *existing* technologies
- collaborate and share.

The DICP developments aligned with these principles. Also, the DICP development benefited from lessons learned from some of the developers engaged in the co-development of a transnational framework for digital health in international cooperation [20, 21]. Further guidance was gleaned from literature and WHO communications.

An evaluation of a national call centre in Guinea argues for the decentralisation and regionalisation of call centres, as the picking up of cases that need attention was found to be higher in local prefectures [22]. During the Ebola crisis, the GSM Association (GSMA), representing the interests of nearly 750 mobile network operators and associated industries at the time, stated: “Where possible, government should activate a call centre or support desks to respond to Ebola enquiries from citizens who call in” [23]. The WHO reported positively about its experience with call centres in times of emergency (for example, Goma [24]). For the COVID-19 pandemic, the WHO advocated using call centres to spread information [25].

The Zimbabwean MoHCC operates a national call centre situated at the Parirenyatwa Hospital in Harare. Regionalisation of this call centre is envisioned, but no resources nor public infrastructure were available to establish such call centre facilities in the provinces. Hence, the conceptualised DICP provided a proof-of-concept and proof-of-production through a Minimum Viable Product (MVP) filling the void. The initial focus was on delivering COVID-19 services for Masvingo Province.

Within two weeks from the initial consultation, the MoHCC had reviewed and approved the concept for developing the DICP as a Zimbabwean eTriage system to be used in Masvingo (Fig. 1). Three months later, at the end of June 2020, a proof-of-concept was presented online to the MoHCC at the national level. Another three months further, a functional proof-of-production – MVP – was demonstrated to the ministry’s provincial leadership in Masvingo province. After securing the platform against malicious traffic and connecting the DICP to public telecommunication networks, the DICP became fully operational in the last quarter of 2020 (Fig. 2).

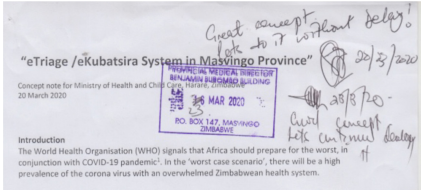


Fig. 1. MoHCC approval to pursue DICP



Fig. 2. DICP leaflet in Masvingo

4 Context of Digital Health

The term digital health is rooted in eHealth and is defined as “the use of information and communications technology in support of health and health-related fields” [26]. In the African context, digital interventions are subject to behavioural, cultural, social, political, and economic determinants [27]. Therefore, digital health development demands comprehensive – not only technical – approaches within the national setting of public health, with careful considerations of national security [28] and efforts to keep health data within relevant sovereignties [29]. Further, digital health interventions, which currently involve a myriad of digital platforms and systems, are to become an integral part and backbone of health operations to facilitate nationwide service provisioning, measurement, and evaluation. They are to harbour a range of tools and applications that are open to public and political scrutiny [11].

Digital platforms encapsulate and frame digital health interventions [2, 3, 30]. They can conceal efforts of geopolitical meddling. Strings attached to aid packages can allow the entry of foreign interests, for instance, for market entrance [31]. At present, China and the USA own around 90% of the digital platform economy worldwide. Africa conjunct with Latin America accounts for 1% only [1]. Opening up to foreign-owned, private digital data gathering platforms poses significant threats for people and national security [30]. Outsourcing the development of digital health infrastructure crowds out local agendas, autonomy, the beneficiation of local capacity, public spaces, national values, and the involvement of national institutes of learning [32]. Using foreign platforms strengthens foreign jobs while disempowering local capacity, subjugating it to “Africa failing” narratives of agency deficits, lack of imagination, and lack of capacity [33, 34].

The 2019 Zimbabwe Multiple Indicator Cluster Survey (MICS) found that mass media had a limited reach [35]: Newspapers reach 26%, radio 58%, and television 43% of the population. Additionally, the survey found that the mobile phone had the highest penetration in households: 85%. In addition, the survey found that about 90% of Zimbabweans had used a mobile phone in the last three months. Therefore, the DICP focuses on the use of mobile phones, albeit cognisant that international reports on mobile phone use might not align with local realities [36].

References from resource-rich environments with long-term embedded systems are no benchmark for interventions in resource-challenged settings. Africa has shown the capacity for leapfrogging due to the absence of legacy systems. An example is the ubiquitous use of digital money platforms. In the Ebola outbreak disaster, companies like

SES (Luxembourg) have benefitted in West Africa, as did various (Western) universities. Disquietingly, all imported digital health infrastructure and most health data were removed after the Ebola projects, leaving African governments and institutes of learning bereft and disempowered [37].

At the time of the first DICP designs, there were not many examples of digital health COVID-19 interventions that could be learned from. However, this situation changed rapidly, with companies, civil society, international organisations, academics, and donors initiating countless initiatives. Developers of US-based digital platforms pledged to provide cloud-based services ‘for free’ during the onset of the pandemic. After a grace period, however, users were expected to pay hefty fees. In the meantime, concepts, designs and data were extracted from Africa and could serve as blueprints for interventions with data stored and processed on the North American continent. Commcare, for instance, stated on its website: “data for projects using <https://www.commcarehq.org> is stored inside within the United States (AWS Data Centre in Northern Virginia)”.

5 Results

The DICP facilitates COVID-19 services that provide health information to the population, consultation and counselling to patients, and information for health care workers while also having the ability to contribute to Zimbabwean data collection, disease mapping and surveillance. During the COVID-19 pandemic, those with COVID-symptoms are encouraged to stay at home. The DICP uniquely facilitates the use of phone access for medical advice and guidance. Phone access can be critical in the case of infectious diseases, for instance, with Cholera outbreaks, and when access to health care is severed as during natural disasters like cyclones Idai in 2019 and Chalane in 2020.

The Digital Information and Consultation Platform (DICP) development used a participatory, co-development approach that relied on volunteering, embedded, local, national, and African capacity aligned with local realities and geared towards African communities in a bottom-up manner. In due course, because of the volatility of the COVID-19 pandemic, everyone was learning ‘on the fly’. With limited COVID-19 funding flowing ‘all the way down’ to intended recipients, the development team relied upon serendipitous rigour, taking advantage of opportunities that would occur and local concepts and practices advancing Zimbabwean communities-of-practice [16, 38, 39].

Software developments used an Agile approach with dedicated digital project management and version control tools. Due to the subsequent and protracted lockdown of all areas and people in Zimbabwe, the engagements and work were primarily sustained in cyberspace. The varied expertise and authorities were grouped into three teams, working in parallel:

- **Medical:** This team focused on designing an electronic/virtual triage process, developing the COVID-19 triage flowchart, and compiling and approving the content for agents, including protocols supporting information sharing and decision making. They safeguarded against duplication of efforts and aligned with the official communications from the Government of Zimbabwe, WHO and other (inter)nationally recognized bodies of knowledge, augmented by insights from the latest health research. The team

consists of certified medical doctors only, including representatives of the MoHCC in Masvingo province (the Provincial Epidemiological Diseases Control Officer), infectious disease specialists at MoHCC headquarters, and a global health expert. The team controlled the medical soundness of the digital health intervention.

- **Communications:** This team was responsible for the design and implementation of a communications server, using free and open software (FOSS) to provide for a contact centre capable of routing numerous concurrent phone calls and messages routed through Voice of IP services to agents located at the Ministry of Health in Masvingo province. The team involved members of the Masvingo Hackathon, computer science and information system experts drawn from the MoHCC and the non-governmental organisation SolidarMed based in Masvingo province. The focus was to keep it simple and affordable by focussing on open source software, equipment readily available in Zimbabwe, and leveraging the practical and academic work done by national and international communities and computer telephony integration developments.
- **Information:** This team took on scripting the web interface and database and dashboard facilities that link incoming caller identification numbers with data registers through the computer telephony integration designed by the communications team,. Each agent has access to supporting information and is led through a triaging process (as designed by the medical team). The team drew upon information technology experts and designers from the MoHCC, Zimbabwean private professionals, and the Masvingo Hackathon. Dedicated Zimbabwean certified IT professionals ensured robust data management and the primacy of privacy and security.

In 2020, in Zimbabwe, the COVID-19 pandemic did not develop into the worst-case scenarios anticipated at the start of the development. Alternative, private initiatives to provide phone-in COVID-19 services, like ZINCAT, ran out of steam and folded their call centre services during the second part of 2020 (without transferring their data-repositories to the MoHCC). Meanwhile, the DICP MVP achieved outcomes embedded in its wider communities. It comprised the first locally developed comprehensive COVID-19 digital health intervention able to cater for a MoHCC coordinated response in Zimbabwe.

SolidarMed raised CHF 45k funding to facilitate the DICP development, training, and initial operations. Agents were selected by the Provincial Medical Directorate of the MoHCC in Masvingo. The initial team of volunteering agents consisted of six MoHCC staff taking turns responding to incoming support requests. These agents include the Provincial Health Information Officer, the supervisor of the group of agents, the Provincial Health Information Assistant, and four Environmental Health Officers/Technicians.

The DICP COVID-19 service became operational during the fourth quarter of 2020. The implementation was hampered by lengthy administrative and security vetting of the organisations involved in securing toll-free Public Telephone Network lines from Zimbabwe telecommunications operators. After months of filing paperwork and meetings, two out of four Zimbabwean telecommunications operators granted access for the DICP through their toll-free telephone numbers.

Disseminating and marketing the availability of the DICP platform was done involving the government's provincial and district offices as well as health facilities and community workers. Furthermore, the toll-free numbers were announced through social media platforms like WhatsApp and Facebook, newspaper adverts, SMS, and other community interactions. Flyers and posters were developed in the Shona, Shangani, and English languages and distributed throughout Masvingo Province (Fig. 2). In addition, three videos for Facebook distribution were created, one addressing the general public, one for Health Care Workers, and one for DICP agent supervisors.

6 Discussion

At the onset of COVID-19, previously cited Tim Unwin warned that many digital development projects focus on donor profiles instead of impact. This distortion would void lessons learned from past failures [40]. He argued the need for careful planning to bring about fundamental changes to infrastructure and government services to ensure their embedding in the world 'after the COVID-19 pandemic'. Though research focusing on the DICP development, the embedding of the DICP as part of an Electronic Health Facility (EHF) was recognised. The DICP is an instance of an EHF; a means to access the national health system through communication devices [41].

Analysis shows the DICP development to be forward resilient [42] through the use of local expertise that autonomously designed the platform and services utilising local infrastructure. User interactions happened iteratively with training events and follow-ups with stakeholders. As soon as the proof-of-concept was shown and the Minimum Viable Product was introduced, discussions started for national scale-up sustained by frequent visits forth and back of MoHCC by the development teams.

6.1 Centring Zimbabwe

The DICP outlook was a digital health intervention that builds up from local knowledge, employing the African values of 'being together' [43], adhering to principles of open- and co-development by engaging communities, enhancing the local workforce, and catering to local and national thought leadership [in line with 21]. Imported digital health systems have track records of complicating matters. They are designed without African needs in mind [12], inflict high cost of ownership, need specialist human resources, and often require high-capacity infrastructures [44]. In addition, the adaptation of imported systems can be resource-intensive customisation processes, while supplier system parameters often change during the adaption processes. However, the DICP developments emerged 'bottom up', focusing on solving local needs in alignment with embodied knowledge in Zimbabwe's communities of practice. The development benefitted greatly from the involvement of the various levels of government, ultimately the most significant party in local, regional (provincial), and national development [45]. The focus on wholesome development in Zimbabwe strengthened self- and cross-pollination, resulting in an embedded, locally built and maintained, modular digital platform offering services that amplify the intent of communities. Further, the development capacitated provincial and national institutions and utilised close-by agency and national capacity to design, produce, install, and maintain the platform and its services.

6.2 Community Engagement

Inclusion and participation are the hallmarks of community engagement [46]. Engagement must be grounded in shared values and shared purpose. Embedded in the authority of the Technical Working Group Digital Health in the MoHCC and focussed on the call for readiness from WHO, the processes maintained focus. A shared purpose – developing a COVID-19 eTriage system in, by, and for Zimbabwe – inspired and expedited co-development and positioned the DICP for sustainability and respect for human rights [16]. Community members, the ultimate health care beneficiaries, co-developed the system and harnessed local resources for its conceptualisation right up to the moment of realisation. From the MoHCC both nationally and in the province, local agendas became the pointers, ownership was embedded, and proceedings propagated among various communities of practice – in health care and information and communication engineering – in Zimbabwe.

In the development of the DICP, knowledge and expertise were found to be readily available within Zimbabwe. It was advanced through dialogue along national values, love for humanity (doing ‘the right thing’ as per *ubuntu/unhu* [43]), orthopraxis, and critical reflection and action synthesis. Dynamic, integral meaning-making, exploring meanings contextually and setting the frame of reference as a logic of local cultures need physical presence to instil embodied, local knowledge and ontological understanding. As a result, the DICP is an embodiment of local knowledge and practices.

6.3 Workforce Enhancement

In line with ethical behaviour, workforce enhancement emancipates local communities and communities-of-practice. The DICP built on what was going well, using locally available tools and equipment, and existing capacity and agency, in line with Zimbabwean policies and visions. Workforce enhancement through the DICP developments was sensitive to power-distances and differences in access to development. Bifurcation and foreign concepts and categorisations were avoided, using locally developed health and systems management guidelines. Alongside the MoHCC (the public) and the communities, the involvement of Zimbabwean universities (academia) and businesses (the private) was critical to the broad development of capacity, reconciling ‘ways of knowing’, balancing formal and informal modes of communication, and aligning with the dominance of oral cultures – putting the ‘who’ in front of the ‘what’ [47].

6.4 Thought Leadership

Thought leadership shares what is known from embodied knowledge [15]. By exercising thought leadership, the communities-of-practice involved in the DICP contributed to the Zimbabwean debate, influenced public policy and availed the relevant expertise and knowledge of professionals [48]. Thought leadership was gained through local development, monitoring and evaluation *in situ*, with the value proposition assessed from local understandings. Thought leadership, where Zimbabwe’s users informed, evaluated, and shared about user experiences of the DICP, allowed for local expressions of its usability.

The project fostered and sustained national capacity to design context-appropriate platforms and applications and implement and maintain the same. Therefore, the DICP development engendered skills development in information and communication technologies (using Zimbabwean resources in academia and business) and allowed Zimbabwean professionals to be productive in the local, national, and international context of digital health for the benefit of the communities from which they come.

6.5 Systems Integration

The system conciliations in the DICP represented social innovation and engagement through expressions of Zimbabwean understanding of resource availability and the beneficiation of digital health data. The integration and acceptance of new systems is a time-consuming and social process. Socialisation was pertinent in all activities by a constant focus integrating the DICP in MoHCC operations. Iterative engagement processes catered for alignment of the system and services needs of the DICP with MoHCC existing systems, emerging needs, and processes. Being vetted and allowed access to Zimbabwean knowledge and capacity involved much coordination with many Zimbabwean stakeholders from various institutes, MoHCC departments, and health care settings. Engendering such involvement necessitated respectful positioning according to local values and measurements of success and understanding of the complex context and powers [21].

6.6 Outlook

As an active partner in the ideation and development of the DICP, Zimbabwe's government took a pivotal role in determining the digital health potential and strategy of the DICP. An upscaling for the DICP, expanding its reach and functionality to include other diseases, are being discussed with MoHCC leadership. The following expansion of the technical components of the platform could be foreseen:

- Expand and specify the triage and information services with amended approaches aligned with the increasingly global and national evidence base regarding the COVID-19 pandemic.
- Continuous enhancement of the efficiency of call routing, messaging, database, and visualisation technologies to improve performance and align with emerging systems, for instance, in electronic health registers; work towards integration with international standards as well as (e.g.) FAIR (Findable, Accessible, Interoperable, Re-usable) data management principles.
- Develop and embed context-appropriate, locally developed data algorithms and harness the potential of Artificial Intelligence (AI) to enhance caller response systems appropriate to the context of both the caller and the agent.
- Enhance real-time reporting and the content of dashboards to inform the MoHCC, including data from other digital health interventions, to facilitate ever more real-time evidence-based decision making and response.

The DICP platform and services can be amended to respond to other disease outbreaks (for instance, malaria, cholera, typhoid) or calamities (e.g. cyclone or road traffic accidents). There is an in-country ability to extend the modular system to respond to the most common diseases in the country. Amendments and enhancements of the platform can be done sovereignly by Zimbabweans, in Zimbabwe, for Zimbabwe.

7 Conclusion

A Digital Information and Communication Platform was developed in Zimbabwe. A collaboration of the Ministry of Health and Child Care and the local communities of practice produced an electronic triaging for COVID-19 related cases against a database that keeps track of calls and case information coming through the contact centre, trained and established an operational, digital COVID-19 counselling and consulting service. The DICP.

1. achieved a cost-effective proof-of-concept and proof-of-production digital health intervention, defined, designed, developed, and implemented in context by provincial and national players in Zimbabwe,
2. showed that developments outside of the capital (from a secondary or tertiary city and relative far away province) are feasible and can be instruments for national developments,
3. provided confidence that Zimbabwe can design, build, and operate an integrated and dynamic information and consultation platform in health to sustain Electronic Health Facilities.

Prioritising national inputs, agency and outputs resulted in a nationally developed, embedded, and owned digital platform for specific health interventions and services, bolstering Zimbabwe's response to COVID-19. Prioritising developments within context counters the threat of data-extraction, (foreign) surveillance, and economic exploitation through, for instance, lock-in technologies, extortive licences, and the transfusion of dependencies. The system is 'built on what is going well', which is central to the National Health Strategy of Zimbabwe [49]. The DICP embodies teamwork and provides a Minimum Viable Product and proof-of-production under the auspices of Zimbabwe's Ministry of Health and Child Care.

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