Chapter 1: Mobile App and Data Specifications for Afro-Colombian Ancestral Medicine Units in Bogota: Technology Affordance and Data Sovereignty Limitations

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Introduction

In the heart of Bogota, Colombia, a unique healthcare initiative has been unfolding since 2014. Kilombos, ethnomedical units providing healthcare services to displaced Afro-Colombian populations, have been operating with municipal funding. These units, led by Afro-Colombian traditional healers, midwives and nurses, practice ancestral medicine that has been historically marginalised. The partnership with the municipality, however, came at a cost: extensive bureaucratic data collection through paper forms, which limited the agency of Kilombos' practitioners and their ability to prioritise their traditional healing methods.

In 2023, one of these units, Kilombo Yumma, hereafter referred to as Yumma, took a significant step toward digital transformation by developing a mobile app to streamline data collection and achieve representation of Afro-Colombian ancestral medicine practices in digital spaces. This chapter explores the journey of Yumma's digital transition, examining the application of human-computer interaction (HCI) principles rooted in decolonial computing and the limitations of achieving data sovereignty for marginalised communities within Western-dominated technological and healthcare systems.

Context: Kilombo Yumma and its digital transition

Kilombos emerged as a response to the displacement of Afro-Colombians due to the Colombian civil war in the 1990s. Despite receiving municipal funding since 2014, the bureaucratic processes imposed on Kilombos through paper-based data collection created friction between their traditional practices and the expectations of modern healthcare audits.

To address these challenges, Yumma, supported by a grant from Share-Net International, sought to transition from paper forms to a mobile app. This move toward digitisation has been part of a broader phenomenon since the 1960s, when digital technologies replaced traditional processes to increase efficiency. However, this shift often comes with challenges, particularly for communities like Yumma, whose practices are deeply rooted in cultural and spiritual traditions that are not easily captured in digital formats.

Theoretical framework

Technology affordance in HCI

The technology affordance theory, as developed by Gibson (1979), refers to the possibilities the environment offers for interaction. In HCI, affordances refer to how the interface enables or constrains the user's interactions with technology. This concept is especially relevant when designing technology for marginalised communities, where cultural and social contexts influence how users perceive and interact with digital tools.

For Yumma, the mobile app's affordances were designed to reflect the cultural realities of Afro-Colombian healers, balancing ancestral and Western medical practices within a single interface. The app's design aimed to provide intuitive interactions aligned with the practitioners' existing workflows while introducing new data management and analysis capabilities.

Data ontology and sovereignty

Data ontology explores the meaning of data in different contexts, recognising that data is not a neutral entity, but one that reflects the values and priorities of the system that collects and uses it. In mainstream healthcare systems, data is often framed from a Western medical perspective, leaving little room for alternative forms of health knowledge, such as Afro-Colombian ancestral medicine.

Data sovereignty refers to the right of marginalised communities to control how their data is collected, used and shared, challenging the dominance of Western data practices and promoting self-determination over their digital information. For Yumma, achieving data sovereignty means having control over their data and ensuring that the data collected reflects the nuances and complexities of their ancestral medical practices.

Methodology: Participatory design and iterative development

To ensure that the mobile app met the needs of Yumma's personnel, we employed participatory design methods involving the healers, midwives and community health workers in the design and development process. This approach aligns with the Scandinavian participatory design model, which emphasises social justice and inclusion by involving users in co-designing the systems that affect them.

The development process included several iterations, with the final iteration session being crucial for validating the HCI affordances and data field specifications (Image 1.1). This session involved:

1. Demonstrating the app's interface to Yumma's personnel.
2. Gathering feedback on stress load, cultural representation and data functionality.
3. Assessing the app's alignment with the day-to-day realities of Yumma's work.
4. Ensuring an intuitive and culturally resonant user experience.



Image 1.1: Demonstration of Yumma's app flows selected

Findings: HCI affordances and data sovereignty in practice

The final iteration session revealed several key insights into how Yumma's personnel interacted with the mobile app:

1. Stress Load: The app's flows significantly reduced the time required for data collection compared to paper forms, alleviating stress on Yumma's personnel. This improvement is critical for ensuring consistent adoption and use of the app. As the nurse reflected:

   'Using the app can focus more on the person and less on the lengthy and cumbersome paper forms.' This shift lightens the workload and re-centre's care on the individual, supporting a more personalised approach foundational in ancestral medicine.

2. Cultural Representation: Yumma's personnel appreciated the visual and linguistic elements that reflected their cultural identity. This included icons representing Afro-Colombian figures and terminology distinguishing between ancestral and Western medicine practices.

There needs to be more than one icon of a woman to reflect the diversity among Afro-Colombians across the country', the healer emphasised during the discussion on cultural representation. 'Our features, our noses, our lips, vary greatly from region to region, and that diversity should be visible in the app. We want icons with braided hair, big earrings, and colours and accessories that reflect who we are.'

Yumma's personnel expressed a strong desire to see their identities fully represented in both visual and linguistic elements, advocating for icons that honour Afro-Colombian aesthetics and for the app to highlight the role of women, in recognition of Kilombos as a female-led initiative.

3. Data Field Specifications: The data fields were designed to capture ancestral and Western medical practices, ensuring that Yumma's unique approach to healthcare was represented. Additionally, the app provided dashboards that allowed Yumma to track the impact of their work, such as the number of checkups, risk evaluations and referrals to the healthcare system. Image 1.2 provides a selection of the screens of the mobile app.



Image 1.2: A general impression of the flows and screen of Yumma's app

Challenges and Limitations: Data Sovereignty and Systemic Barriers

While the mobile app presents significant opportunities for Yumma, it also highlights the limitations of achieving data sovereignty within systemic constraints. Although Yumma now has greater control over data collection and management, leveraging this data remains challenging due to a lack of resources and infrastructure.

Moreover, Yumma's data still needs to be recognised by the broader healthcare system, limiting its impact on public health outcomes. For data sovereignty to be meaningful, Yumma must establish partnerships with larger organisations to help manage their data and advocate for including Afro-Colombian ancestral medicine in national healthcare policies.

Discussion: A path toward decolonising digital health and data sovereignty

The development of the Yumma mobile app serves as a case study of how digital health solutions can support marginalised communities. However, it also underscores the need for systemic change to ensure these communities can fully benefit from technological advancements. Data sovereignty offers a framework for resisting data colonialism, however, it requires a commitment to building the necessary infrastructures and capabilities within the communities.

As Yumma continues navigating the complexities of digitising their practices, their journey highlights the importance of designing digital tools that reflect non-Western communities' cultural and spiritual realities. This pluriversal approach to HCI and data challenges the dominant narratives in digital health and offers a more inclusive vision for the future of healthcare.

Conclusion

The Yumma mobile app addresses Afro-Colombian ancestral medicine practitioners' systemic challenges. By integrating ancestral and Western medical practices into a single digital platform, the app provides Yumma

with a tool to collect, manage and interpret their data in ways that align with their cultural values.

Achieving true data sovereignty will, however, require continued efforts to:

1. Build capacity within the community;
2. Establish partnerships with supportive organisations; and
3. Challenge structural inequalities within the healthcare system.

Future research should explore how data sovereignty can be operationalised for marginalised communities in other contexts and how digital health solutions can be designed to support more inclusive and pluriversal approaches to healthcare. The Yumma case study offers valuable insights into the potential as well as the challenges of using technology to empower marginalised communities in healthcare settings, paving the way for more equitable and culturally sensitive digital health solutions.

References

Ali, S.M. 2016. A brief introduction to decolonial computing. *XRDS: Crossroads, The ACM Magazine for Students,* 22(4): 16–21.

Boas, G. 1927. The datum as essence. *The Journal of Philosophy,* 24(18): 487–497.

Boellstorff, T. 2013. Making big data, in theory. *First Monday,* 18(10).

Bogota. 2013, May 6. *Distrito lanzó política pública en salud para población afrodescendientes (District launches public health policy for Afro-descendent population)*. [Online]: Available at:https://bogota.gov.co/en/node/1693. [Accessed on 15 August 2023].

Braithwaite, R.L., Bianchi, C. and Taylor, S.E. 1994. Ethnographic approach to community organization and health empowerment. *Health Education Quarterly,* 21(3): 407–416.

Calzati, S. 2021. Decolonising "data colonialism" propositions for investigating the realpolitik of today's networked ecology. *Television & New Media,* 22(8): 914–929.

Ceravolo, P., Azzini, A., Angelini, M., Catarci, T., Cudré-Mauroux, P.,

Damiani, E. and Zaraket, F. 2018. Big data semantics. *Journal on Data Semantics,* 7: 65–85.

Ciappei, C. and Cinque, M. 2015. Strategic data-based wisdom: Applying Aristotle's theory of action to the DIKW model. *Strategic Data-Based Wisdom in the Big Data Era,* 172–196.

Das, D. and Semaan, B. 2022. Decolonial and postcolonial computing research: A scientometric exploration. In: *Companion publication of the 2022 conference on computer supported cooperative work and social computing*, 168-174.

De Haan, J. 2006. How emergence arises. *Ecological Complexity,* 3(4): 293–301.

Dutta, M., Ramasubramanian, S., Barrett, M., Elers, C., Sarwatay, D., Raghunath, P. and Zapata, D. 2021. Decolonizing open science: Southern interventions. *Journal of Communication,* 71(5): 803–826.

Escobar, A. 2010. *Territorios de diferencia: Lugar, movimientos, vida, redes (Territories of difference: Place, movements, life, networks)*. (translated by E. Restrepo) Carolina del Norte: Envión Editores.

---- 2011. Sustainability: Design for the pluriverse. *Development,* 54: 137–140.

Gibson, J. J. 2014. The Theory of Affordances (1979). In *The people, place, and space reader*, edited by Giesking, J.J., Mangold, W., Katz, C. Low, S. and Saegert, S. New York: Routledge.

Govers, M. and Van Amelsvoort, P. 2019. A socio-technical perspective on the digital era: The Lowlands view. *European Journal of Workplace Innovation,* 4(2): 142 - 159.

Gray, K. and Gills, B. K. 2016. South–South cooperation and the rise of the Global South. *Third World Quarterly,* 37(4): 557–574.

Hjørland, B. 2018. Data (with big data and database semantics). *Knowledge Organization,* 45(8): 685–708.

Horne, J. 2018. Visualising Big Data from a Philosophical Perspective. In Segall, R.S. and Cook, S. (eds), *Handbook of Big Data Storage And Visualization Techniques*. Hershey: IGI Global.

Hummels, C.C. and Lévy, P. 2021. Education as a transforming practice designing together for complex, sustainable living. In: *Relating systems thinking and design (RSD10) 2021 symposium. Delft, Netherlands.*

Kitchin, R. 2014. Big Data, new epistemologies and paradigm shifts. *Big Data & Society*, 1-12.

Ledo, D., Houben, S., Vermeulen, J., Marquardt, N., Oehlberg, L. and Greenberg, S. 2018. Evaluation strategies for HCI toolkit research. In: *Proceedings of the 2018 CHI conference on human factors in computing systems,* Paper 36: 1–17.

Mayer-Schönberger, V. and Cukier, K. 2013. *Big data: A revolution that will transform how we live, work, and think*. Houghton Mifflin Harcourt, Boston, Massachusetts.

McMahon, A. 2016. Datum/data–more than a grammatical obsession. *Journal of Research in Nursing*, 21(8): 579–581.

Merleau-Ponty, M. 1962. *Phenomenology of perception* (Vol. 26). London: Routledge.

Nino, L., Alarcon, D., Cristancho, D.V. and Yoo, D. 2023. Facilitating female migrants accessing healthcare systems through apps: An asset-based design case study translating social capital of community organizations in digital tools. *DISCERN: International Journal of Design for Social Change, Sustainable Innovation and Entrepreneurship,* 4(1): 12–26.

Nino, L., Yoo, D., Hummels, C. C. and Fernandez, C.N. 2023. Systemic design principles guiding perinatal mobile app for ethnomedical midwifery unit in Bogota: Enabling plurality in ICT public health surveillance. In: *RSD11: Possibilities and practices of system design*. University of Brighton, U.K.

Ramanathan, N., Fruchterman, J., Fowler, A. and Carotti-Sha, G. 2022. Decolonize data. *Stanford Social Innovation Review,* 20(2): 59–60.

Reyes, A. 2014. Linguistic anthropology in 2013: Super-new-big. *American Anthropologist,* 116(2): 366–378.

Rodríguez, S.P.P., Madroñero, O. and Getial, P.E. 2016. Traditional-Ancestral Medical System in the Territory of the Pastos Indigenous Reserve, Túquerres, Nariño, Colombia. *Ciencia e Interculturalidad (Science and Interculturality),* 19(2): 66–80.

Sheth, A. 1996. Data semantics: What, where and how. In: *6th IFIP working conference on data semantics (DS-6), Atlanta, GA*.

Slakey, T. J. 1961. Aristotle on sense perception. *The Philosophical Review,* 70(4): 470–484.

Smith, R.C., Winschiers-Theophilus, H., Loi, D., de Paula, R.A., Kambunga, A.P., Samuel, M.M. and Zaman, T. 2021, May. Decolonizing design practices: towards pluriversality. In: *Extended abstracts of the 2021 CHI conference on human factors in computing systems,* Article No.:83: 1–5.

Strum, S.S. and Latour, B. 1987. Redefining the social link: from baboons to humans. *Social Science Information,* 26(4): 783–802.

Teodoro, T. and Afonso, P. 2020. Culture-bound syndromes and cultural concepts of distress in psychiatry. *Revista Portuguesa de Psiquiatria e Saúde Mental (The Portuguese Journal of Psychiatry and Mental Health),* 6(3): 118–126.

Verbeek, P.P. 2008. Disclosing visions of technology. *Techné: Research in Philosophy and Technology,* 12(1): 85–89.

Yumma Nurse and Healer. 2023. *Personal communication on the use of the Kilombo Yumma app*. Unpublished interview.