

# Afrocentric Trustworthy Framework for Improved Artificial Intelligence Powered Health Management Tool for Africans

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**Abstract:** In recent years, artificial intelligence (AI) has made significant strides in transforming various industries, including healthcare. AI-powered systems are being increasingly integrated into health management, diagnosis, and treatment processes, promising improved efficiency and outcomes. Significantly, the success of AI in healthcare globally depends not only on its technical capabilities but also on the trust and acceptance of the systems by the users. Africa as a heterogeneous entity with diverse resources, diverse cultures, ethnicities and interpersonal relationships; should have ideally been a fertile ground for the adoption, establishment and sustainable growth of Artificial Intelligence (AI) across various sectors, with a particular focus on healthcare. This is owing to the continent's abundant and continually expanding data landscape, a multitude of languages, and unique locally tailored solutions to health-related challenges. However, the impositions of western terminologies and frameworks in health data clustering, analysis and pattern mining for investigative healthcare decision support systems has consistently negates the Afrocentric heritage of transparency and explainability in fairness to an African rich tailored localized context, which are deeply rooted in her culture, language diversity, inter-ethnic relationships and traditions. Although the limited digital health infrastructure, public perception of AI's impact and data privacy concerns can also hinder data availability and adoption rates; the unknown domain-specific knowledge of Afrocentric solutions to Africa's' health challenges remain a major challenge to Trustworthy AI in Africa. In this research, we presented 7 requirements for an Afrocentric Trustworthy AI Framework that combines ethical principles (such as transparency & interpretability, privacy & safety of data, justice & fairness) with Africa's social values (such as respect and human-centeredness – cultural responsiveness, sociableness, community). Using localized innovative healthcare remedies, capacity building, and inter-community diversity and engagement, we contextualized and tailored the requirements to the development of a trustworthy AI that will address peculiar complexities associated with healthcare services in the African context and win the trust of the healthcare stakeholders in Africa. Here, by

harnessing public resources from patients, healthcare providers, and managers, the problems of trust in Africa's health sector were defined, associated bias due to language, ethnicity, and traditions were identified, and the concepts of Africa's cultural heritage to healthcare management were introduced. Finally, the research highlighted the potential benefits of integrating Africa's cultural elements into AI-driven health management systems. By aligning AI technologies with the values, practices, and narratives of African societies, the research established that user trust, engagement, and acceptance were enhanced. Similarly, as AI continues to revolutionize healthcare, we justified that the consideration of the Africa cultural and ethical context in its design and development remains an essential priority for realizing its full potential and ensuring its seamless integration into the African healthcare landscape.

## **1. Introduction**

### **1.1 Background**

The rapid advancement of artificial intelligence (AI) has permeated various aspects of global society, presenting both transformative opportunities and ethical challenges. In the African context, with its rich tapestry of cultures, languages, and ethnicities, the potential impact of AI is particularly significant. According to Eke et al., (2023a), Africa's diverse socio-cultural landscape, characterized by a multitude of languages and traditions, should inherently position the continent as a fertile ground for the widespread adoption and integration of AI technologies. However, as AI increasingly becomes pervasive, concerns about biases and ethical considerations have gained prominence. In their exploration of the implications of AI in Africa, Eke et al., (2023b) highlight the pressing need for culturally sensitive approaches. The "one-size-fits-all" approach often seen in AI development can lead to biased algorithms that may inadvertently perpetuate existing disparities.

Africa's linguistic diversity and locally defined innovations provide a unique set of challenges and opportunities for AI applications, particularly in critical sectors such as healthcare. The importance of a nuanced approach is underscored by the fact that health-related challenges in Africa are not only diverse but also deeply intertwined with cultural and societal factors (Pell et al., 2011). Against this backdrop, this chapter delves into the concept of Afro-centric Trustworthy AI, aiming to address the pressing need for AI technologies that are not only culturally inclusive but also

ethically sound. By building upon recent works that emphasize the importance of cultural sensitivity and inclusivity in AI development, this chapter seeks to contribute to the ongoing discourse on creating AI systems that resonate with and benefit the diverse communities across the African continent.

## **1.2 Challenges in AI-based healthcare for Africa**

The diversity of Africa, spanning cultural, economic, and healthcare contexts, accentuates the ethical imperatives of transparency, explainability, and fairness in AI systems. A nuanced approach, cognizant of the continent's varied circumstances, is essential to developing AI technologies that respect and enhance the well-being of diverse African populations.

In the realm of artificial intelligence, the pervasive challenges and biases that emerge are particularly pronounced in the African context, with healthcare-based AI tools facing unique obstacles that demand careful consideration. One of the critical challenges lies in drug discovery and pharmacognosy, where the data used to develop drugs often lack representation from Africa. This bias in data sources has far-reaching implications for healthcare on the continent. As illuminated by Masimirembwa and Matimba (2012), the scarcity of African-centric data in drug development not only hinders the efficacy of pharmaceutical interventions but also perpetuates a cycle of underrepresentation and insufficient understanding of the unique genetic and physiological characteristics of African populations.

Moreover, in the context of cancer treatments, a notable gap persists in the availability of medical data from African healthcare facilities. The limited data on prevalent cancer types and variants among African populations pose a significant challenge in tailoring treatments to the specific needs of the citizenry. Adequate representation in medical datasets is crucial for the development of targeted therapies. As observed by Ramsey (2018), the absence of diverse and comprehensive medical data hinders the progress in implementing precision medicine in Africa, leading to generalized approaches that may not be optimally effective for the region's distinct genetic profiles. The biases in healthcare-based AI tools thus extend beyond algorithmic limitations to systemic issues related to data representation. Addressing these challenges requires concerted efforts to collect and incorporate diverse, region-specific data, ensuring that AI technologies are not only effective but also equitable in meeting the healthcare needs of African populations. By

acknowledging and rectifying biases at the data level, healthcare-based AI tools can better contribute to improving medical outcomes in Africa.

### **1.3 Aim and Objectives**

In recognizing the multifaceted challenges and biases outlined in the preceding sections, there emerges a compelling need for the development and implementation of Afro-centric Trustworthy AI. The identified issues, spanning cultural disparities, economic inequalities, and healthcare data gaps, underscore the imperative for a tailored approach that respects and addresses the unique complexities of the African context. This work is dedicated to spearheading Afro-centric Trustworthy AI tailored for healthcare. It endeavours to tackle biases and challenges, crafting an innovative framework that harmonizes cultural sensitivity, ethical integrity, and inclusivity for the benefit of diverse healthcare contexts across Africa. The specific objectives it achieves are:

1. **To develop an Afro-centric Trustworthy AI Framework:** Formulate a specialized framework tailored for healthcare AI solutions in Africa, prioritizing cultural sensitivity and ethical considerations.
2. **Address Biases and Challenges in Healthcare AI:** Investigate and propose solutions to biases and challenges specific to healthcare AI in Africa, ensuring alignment with diverse population needs.
3. **Promote Ethical Deployment in Healthcare:** Advocate for the ethical use of AI in healthcare, emphasizing inclusivity, fairness, and transparency, particularly in addressing vulnerabilities in African populations.
4. **Foster Collaboration and Stakeholder Engagement:** Encourage collaboration among technologists, policymakers, and local communities to ensure the relevance and effectiveness of the Afro-centric Trustworthy AI framework in addressing healthcare challenges in Africa.

The rest of this chapter discusses the current state and challenges of AI in healthcare in Section 2, the relationship between African cultural values and “trustworthiness” in Section 3, our methodology for building an Afrocentric Trustworthy frame for AI healthcare in Section 4,

mechanisms for adopting and scaling AI healthcare technologies in Africa in section 5, ethical considerations and regulations in section 6 and conclusion and recommendations in section 7.

## **2. AI in Healthcare: Current State and Challenges**

The contemporary landscape of healthcare-based AI systems reflects a paradigm shift in medical research, diagnosis, and treatment. Advanced machine learning algorithms, powered by extensive datasets and computing capabilities, have demonstrated remarkable capabilities in diverse medical applications. AI-driven diagnostic tools, such as image recognition algorithms for medical imaging, exhibit promising accuracy rates, streamlining the identification of abnormalities and contributing to early disease detection (Esteva et al., 2019). Additionally, natural language processing algorithms are transforming the analysis of clinical texts, enhancing the speed and precision of information extraction from electronic health records (Miotto et al., 2017). The integration of AI into predictive modelling for patient outcomes and treatment responses is reshaping personalised medicine, offering tailored interventions based on individual characteristics and health histories.

Despite these advancements, the widespread adoption of AI in healthcare is not uniform across regions, with disparities in access to technology and infrastructure presenting challenges. Developed countries often lead in the integration of AI into healthcare systems, benefiting from well-established technological infrastructures and extensive data resources. In contrast, many developing nations face barriers, including limited access to high-quality data, insufficient computational resources, and inadequate regulatory frameworks (Topol, 2019). Bridging this digital divide is essential to ensure equitable access to the benefits of healthcare-based AI systems. Some Challenges in Healthcare-based AI Systems include:

1. **Data Quality and Availability:** The reliability and representativeness of AI models heavily depend on the quality and diversity of the data used for training. In many healthcare settings, particularly in Africa, there is a scarcity of comprehensive and diverse datasets, leading to potential biases and limitations in the generalizability of AI models (Njei et al., 2023).

2. **Interoperability and Integration:** The seamless integration of AI systems with existing healthcare infrastructures poses a significant challenge. Diverse data sources, different formats of electronic health records, and varying standards across healthcare providers hinder the interoperability necessary for effective AI implementation (Tarnawski et al., 2021).
3. **Ethical and Regulatory Concerns:** The ethical implications of using AI in healthcare, including issues of patient privacy, consent, and the responsible handling of sensitive medical data, require careful consideration. Developing clear regulatory frameworks to address these concerns is crucial for ensuring trust in AI technologies (Char et al., 2018).
4. **Explainability and Interpretability:** The "black-box" nature of some AI algorithms in healthcare raises challenges in explaining and interpreting their decisions. In critical medical decisions, understanding how AI arrives at conclusions is essential for gaining acceptance from healthcare professionals and building trust in the technology (Rudin, 2019).
5. **Resource Constraints:** Many healthcare facilities, especially in resource-limited settings, face challenges in adopting and maintaining AI technologies. Insufficient computational resources, lack of expertise, and financial constraints hinder the implementation of advanced AI solutions, limiting their accessibility (Litjens et al., 2017).

Addressing these challenges is essential for realizing the full potential of healthcare-based AI systems, particularly in the context of developing regions like Africa. As we explore solutions, the aim is to develop strategies that ensure the ethical, equitable, and effective integration of AI technologies into diverse healthcare landscapes.

### **3. African Cultural Values and Trust**

Africa's rich cultural diversity offers a unique perspective to examine the interplay between cultural values, trust, and healthcare. This section explores the nuances of African cultural values, focusing on trust, community, and respect, and evaluates their profound implications for healthcare. As we traverse the continent's diverse cultural landscape, we also investigate how these values can be applied to modern healthcare and emerging technologies, particularly Artificial Intelligence (AI) systems

### **3.1 African Cultural Diversity: A Mosaic of Traditions**

Africa's rich cultural diversity stems from a complex history marked by migration, trade, and colonial influences, resulting in distinct traditions among its various ethnic groups (Adisa, 2018). Trans-Saharan trade routes and Bantu-speaking migrations have significantly contributed to cultural diffusion across the continent (Hrbek, 1992). The continent's cultural diversity varies widely among its 54 countries, with West Africa's vibrant cultures, East Africa's unique customs, and Southern Africa's rich heritage (Makoni, 2020). These variations are influenced by geography, climate, and historical experiences. Africa's linguistic diversity, with over 2,000 languages, reflects its cultural richness, impacting communication, social interactions, and healthcare practices (Makoni, 2020). The holistic perception of health in many African societies includes physical, mental, spiritual, and social well-being, shaping views on illness and wellness. Traditional healing practices, rooted in centuries-old wisdom, coexist with modern medicine, promoting collaboration for culturally sensitive healthcare delivery (Nkosi & Abiola, 2017). African traditions showcase resilience and adaptability throughout history. Understanding this intricate tapestry is crucial for maintaining cultural heritage and providing respectful healthcare services to diverse populations, relying on trust and interconnectedness.

### **3.2 Ubuntu Philosophy: Trust in Interconnectedness**

The Ubuntu philosophy, integral to African culture, emphasises individuals' interconnectedness within a community, encapsulated by the saying "I am because we are" (Duru, 2019). Trust is foundational in Ubuntu, as mutual support defines well-being. It underscores the idea that one's identity is tied to the collective, fostering mutual responsibility and shared destiny.

1. **Respect for Elders, Wisdom, and Trust:** Esteeming elders for their wisdom is pivotal in decision-making (Nkosi & Abiola, 2017). Trust in healthcare is influenced by respecting healthcare professionals who appreciate community wisdom. Building trust involves incorporating elders' perspectives for cultural competence.
2. **Oral Tradition, Storytelling, and Trust:** Oral tradition and storytelling transmit knowledge in African cultures (Smith, 2015). Trust is cultivated through shared narratives that create community connections. In healthcare, storytelling enhances trust by making information culturally relevant. It serves as a bridge, fostering mutual understanding.

3. **Ancestor Reverence and Trust:** Many African societies revere ancestors as guides and protectors. Trust in healthcare practices is established by acknowledging and respecting these beliefs. Recognizing ancestral influence fosters cultural sensitivity, reinforcing trust between healthcare providers and communities (Mbiti, 1990).

Understanding the Ubuntu philosophy offers insights for healthcare practitioners aiming for culturally competent care in African communities, strengthening trust bonds. Adopting these cultural nuances presents opportunities and challenges, as discussed in the next subsection.

### **3.3 Trust in Healthcare: Challenges and Opportunities**

Trust is pivotal in healthcare, influencing relationships among providers, patients, communities, and emerging technologies like Artificial Intelligence (AI). In the dynamic healthcare landscape, understanding trust intricacies is vital, presenting both challenges and opportunities. This exploration delves into trust's multifaceted nature, considering historical, cultural, and socio-economic factors shaping its complexities. Navigating these challenges reveals opportunities for building trust within healthcare, striving for more patient-centered, inclusive, and technologically adept practices.

1. **Historical Context and Mistrust:** Colonisation and exploitation historical impact persists, influencing healthcare trust (Smith, 2015). Acknowledging this history is vital for providers to understand mistrust roots and work towards rebuilding trust within communities.
2. **Cultural Competence for Bridging the Gap:** Bridging gaps requires cultural competence in healthcare (Ofori-Atta & Osei, 2016). Respecting traditional values, integrating cultural rituals, and involving the community in decisions build trust.
3. **Community Engagement and Participatory Healthcare:** Trust is strengthened through community engagement and participatory approaches (Ofori-Atta & Osei, 2016). Including the community in decision-making, seeking input on policies, and addressing concerns fosters ownership and trust.

4. **Socio-Economic Considerations:** Examining socio-economic factors influencing healthcare trust is crucial. Economic disparities, accessibility issues, and resource availability shape trust levels within communities.

In navigating healthcare's complex landscape, recognizing cultural values is pivotal for fostering trust, inclusivity, and effectiveness. Having explored trust challenges and opportunities, attention now turns to applying cultural values, especially in traditional practices and integrating technologies like Artificial Intelligence (AI). This exploration delves into how cultural nuances shape healthcare, making it more responsive to diverse patient needs. Examining the interplay between cultural values, healthcare, and AI reveals pathways to create ethically sound, culturally sensitive, and technologically advanced systems for a globalised and diverse population.

1. **Culturally Competent Healthcare Delivery:** Applying African cultural values involves embracing culturally competent approaches, recognizing health's holistic nature, incorporating traditional healing practices, and fostering respectful partnerships.
2. **Integrating Traditional Wisdom into Modern Healthcare:** Respecting and integrating traditional wisdom enhances trust within healthcare systems. Acknowledging cultural significance, collaborating with traditional healers creates holistic and culturally sensitive healthcare plans.
3. **Storytelling and Health Education:** Leveraging storytelling enhances health education. Incorporating culturally relevant narratives bridges communication gaps, making information more relatable to diverse communities.
4. **Ancestor Reverence and Healing Practices:** Acknowledging ancestor reverence, healthcare practices can incorporate cultural rituals, contributing to a more holistic healing experience and enhancing trust.
5. **AI Systems Informed by Cultural Values:** As healthcare embraces AI, infusion of African cultural values becomes crucial. Designing AI technologies with cultural sensitivity respects interconnectedness and holistic health concepts.
6. **Ethical Considerations in AI Applications:** AI in healthcare requires ethical considerations aligning with African cultural values. Addressing data privacy,

informed consent, and transparency with cultural sensitivity builds and maintains trust in these technologies.

In the dynamic intersection of healthcare, technology, and diverse cultural values, we stand on the cusp of an era demanding foresight, adaptability, and dedication to inclusivity. After exploring cultural value applications in traditional healthcare and Artificial Intelligence (AI) systems, our journey propels us into future directions and the global implications of these integrations. This section aims to navigate healthcare's evolving landscape, anticipating trajectories shaped by cultural sensitivity, technological advancements, and global collaboration. Our exploration unfolds with the intent of shaping healthcare systems transcending borders, celebrating diversity, and fostering positive global impact. Hence, applying African cultural values to healthcare involves a multifaceted approach respecting diversity, traditional wisdom, and the holistic principles of Ubuntu. As healthcare embraces AI, ensuring cultural sensitivity and ethical considerations in technological advancements is crucial. Integrating these values enriches healthcare and fosters equitable, inclusive global systems. This exploration as discussed in section four offers a pathway to a patient-centred, culturally competent, and technologically advanced healthcare future, addressing diverse needs. The global implications of this integration are profound wherein lessons from African cultural values can blueprint culturally sensitive healthcare strategies worldwide, prioritising inclusivity and responsiveness.

#### **4: Afrocentric Trustworthy Framework for AI-based Healthcare**

##### **4.1 Trustworthy AI Principles and Guidelines**

Studies highlight the necessity to foster “trust” among stakeholders, including governments, AI companies, and communities at large. Along with ensuring data protection, responsible AI practices, and ethical principles (transparency, accountability, fairness, etc), it is also important to involve relevant stakeholders and users/communities in developing and deploying AI interventions as that will enable them to contribute to the AI system lifecycle processes, enhance understanding and acceptance (Alupo et al. 2022). The creation of a structured and supportive AI business environment through the enactment of socially-appropriate regulatory policies and frameworks, education and awareness, iterative enhancement of AI systems based on user feedback are essential in entrenching trust and shaping public perceptions about AI systems and what they could be used

to achieve (Rossi, 2018). In comparison to other AI frameworks, trustworthy AI aims to ensure that AI technologies are safe and reliable; both technically (performance) and socially (context and usage) and does not cause unintended harms to users. Following the release of the European Commission Ethics Guidelines for Trustworthy AI in 2019 (EU Commission, 2019), Floridi (2019) adapted and identified seven essential requirements to achieving trustworthy AI and they include 1) human agency and oversight, 2) robustness and safety, 3) privacy and data governance, 4) transparency, 5) diversity, non-discrimination, and fairness, 6) societal and environmental well-being, and 7) accountability. These are critical to promoting fundamental rights and upholding human autonomy, dealing with errors/inconsistencies throughout the AI system lifecycle, advancing transparency, privacy, and personalized data control. Also, they would promote inclusion and accessibility, sustainability, and responsibility, which are values that should drive new AI innovations instead of an afterthought (Floridi 2019).

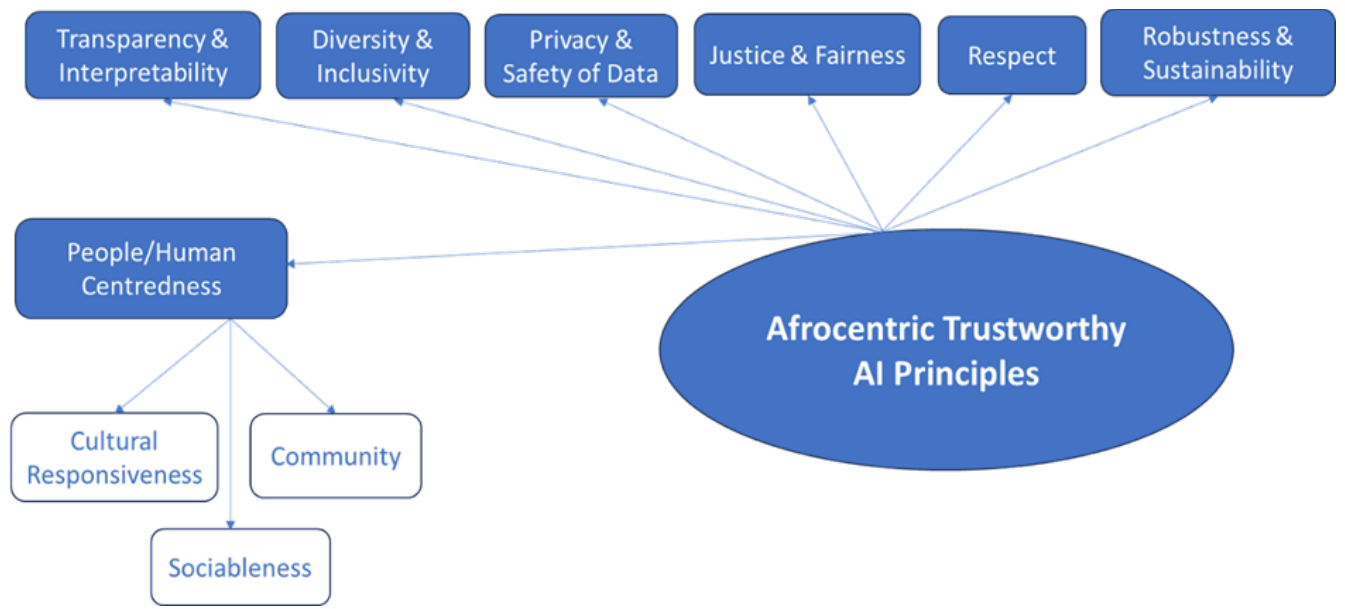
#### **4.2 The Need for Afrocentric Trustworthy AI Framework**

Previous studies have proposed various ethical principles and guidelines to guide the design and implementation of artificial intelligence (AI) systems for healthcare management. For instance, Adamu & Nkwo (2023) attempted to expose how the propagation of AI-led initiatives across Africa is fostering cultural dominance and control of western values. They proposed how those principles could be incorporated as practical abstractions to the re-design of AI-mediated technologies that will support community-wide aspirations and capabilities (Adamu & Nkwo, 2023). On another note, Amugongo et al. (2023) in their case-based model, identified and implemented seven (7) ethical principles (including fairness, agility, precision, safeguarding humanity, respect for others, trust and accountability, and robustness and reproducibility) in the commonly used software development process. While these previous studies have demonstrated the applicability of AI ethics principles in guiding the design and deployment of AI technologies for healthcare, it is not clear how much these efforts address the issues associated with the unique complexities of the African context, spanning cultural disparities, inequalities and vulnerabilities, and healthcare data gaps. Panch, Mattie, & Celi, (2019), opines that the black-box nature of some of these AI/ML models and the difficulties in integrating AI into the regular clinical workflow makes it complicated for community healthcare workers to understand the machine. Moreover, factors such as resistance to change and lack of user-friendly interfaces (Panch, Mattie, & Celi,

2019) makes it difficult for the healthcare workers to “trust” the decisions designed using these models, hence impeding the effective implementation of AI in healthcare practices especially in the developing communities in Africa. The extent to which the implementation of these ethical guidelines on healthcare technologies could promote “trust” among stakeholders in the healthcare (healthcare professionals, community healthcare workers and patients) and guide the adoption and utilization of AI technologies in healthcare practices in Africa remains to be seen. We believe that building an AI system for healthcare should not only be about integrating ethical principles of AI into the system. AI technologies built for the healthcare services must explore the issues of “trustworthiness” – honesty, reliability, and dependability, and cultural sensitivity to the ethical values of the target users. These are critical because healthcare is a specialized domain and would require the predictive models to provide consistent and socially reliable outcomes across board. To fill these identified gaps, we propose an integrated Afrocentric Trustworthy AI Framework which could guide the development of AI technologies for healthcare that would be win the trust of the healthcare stakeholders in Africa.

#### **4.3 Prerequisites for an Afrocentric Trustworthy AI Framework for Healthcare**

In this current research, we present an Afrocentric Trustworthy AI Framework for healthcare (Fig 1) that addresses the gaps in Afrocentric values and social complexities associated with existing AI frameworks by incorporating relevant indigenous ethical/social values (such as Ubuntu, respect, sociableness, community - which are relational in nature) to complement existing Western trustworthy AI principles. While some of the ethical principles in our framework have similarities with some of the factors considered by (Adamu and Nkwo, 2023; Amugongo et al., 2023; Floridi, 2019), we presented “diversity and inclusivity” and People/Human-centeredness, which addresses equal representation and opportunity as well as cultural responsiveness, and sociableness which are crucial to community health sciences/practices (Arueyingho et al., 2023; Göttgens and Oertelt-Prigione, 2021) and in winning the trust of the local population.



**Fig 1: Afrocentric Trustworthy AI Framework**

Below, we identified, contextualized, and tailored seven crucial requirements for an Afrocentric trustworthy AI framework in healthcare which addresses peculiar complexities associated with healthcare services in the Africa context.

**4.3.1 Transparency and Interpretability:** While transparency in AI technology in the African context entails clear and open communication in healthcare processes, and decision-making, interpretability ensures AI explains how its algorithm reached a definite decision or made definite recommendation. The prerequisites necessary for the operationalization of transparency and interpretability in trustworthy AI in African healthcare would include user-centric designs and feedback mechanisms. These ensure user interfaces and other materials are intuitive and available in the local language, and healthcare data and information of patients and related service information (costs) are stored, shared securely (aligning with local and international privacy regulations), and communicated in ways that doesn't reinforce existing biases. They should be accessible to diverse cultural, language, and literacy levels –via interactive dashboards. Feedback mechanisms should be implemented in the same manner to allow users to report health and system issues, provide suggestions, and express concerns in real time. It is important to partner with stakeholders (local community health workers, governments, and health-based NGOs) to enhance health and AI literacy, engage with local community to develop and deploy AI, and ensure that AI

aligns with the cultural norms/practices of the people. Designers must prioritize the use of explainable-AI models that communicate how AI algorithms make decisions, especially in diagnostic and treatment recommendation systems. This type of open-source AI models will promote collaboration, customization-to-fit local healthcare contexts, and could potentially make it easier for patients to use it to manage their health. Our results agree with recent previous study which shows that prioritising transparency by design and user-involvement in building socio-culturally sensitive user inter-faces of AI would offer clarity about the functionality, limitations, and the ability of the AI system to provide feedback should there be erroneous or harmful AI outcomes in the future (Adamu and Nkwo, 2023). We posit that these are fundamental to fostering acceptance and trust in the information presented by AI, ensuring the adoption of ethical practices, and improving healthcare service delivery and patient outcomes.

**4.3.2 Diversity and Inclusivity:** Implementing diversity and inclusivity entails that AI for healthcare are designed and deployed in a way that are accessible and beneficial to diverse healthcare stakeholders regardless of their cultural, linguistic, geographical, or socioeconomic status. For instance, inclusivity could be implemented in AI for health to offer accessibility system features and interfaces that serve individuals with diverse disabilities including visual, auditory, and motor challenges. This would empower patients to have access and understand their health information, make informed decisions, and actively participate in their care. Involving diverse stakeholders in healthcare and fostering community engagement in design/development processes would ensure that AI is flexible (allow users to tailor the application to their individual needs), and culturally competent (respects and aligns with values of the people). This can be realized via AI capacity building for community healthcare workers and patients with a view to ensuring equitable access to services and facilities, and providing user-friendly interfaces and visual aids that are accessible to various groups of individuals to enhance comprehension and engender trust. The results agree with recent research which suggests that implementing diversity, equity, and inclusion (DEI) into a system would help to drive effective and authentic advocacy for social change. This is because it will serve as one of the guiding principles for the organization's business relationship (Gutterman 2023).

**4.3.3 Privacy and Safety of Data:** While privacy in healthcare is crucial to safeguard individuals' sensitive health information, safety is critical to ensuring the health and wellbeing of the healthcare stakeholders. Privacy and safety can be implemented in AI in the African context by anonymizing identities of patients in health datasets and providing mechanism for them to control their health data (access, review, update their data). Implementing robust security measures (encryption protocols, secure transmission channels, etc), and tracking measures to monitor access and prevent potential privacy breaches would promote accountability and trust in the AI for healthcare. Afrocentric AI developers must engage local community to understand privacy, safety concerns and expectations via education, adopt the principle of data minimization (collecting only the necessary information for the intended purpose), as well as establish robust informed consent procedures. These approaches will ensure that AI aligns with cultural norms and values and build trust in users. Designing user interfaces that are intuitive, user-friendly, and supportive would promote safe and error-free interactions with AI system and enhance understanding/adherence to safety instruction which are essential for safe technology usage. These results agree with research which suggest that citizens must have full control over their own data, while data concerning them will not be used to harm or discriminate against them (Floridi 2019).

**4.3.4 Justice and Fairness:** Justice and Fairness in Trustworthy AI in healthcare is crucial to ensuring reliable, culturally sensitive, and equitable access to healthcare services across the community and avoid biased algorithms. To ensure justice and fairness in deploying AI, adequate bias testing and corrective measures must be done in designing machine learning models (Xivuri and Twinomurizi, 2023). This implies AI developers must be trained to adapt and engage stakeholders in productive conversations about their research and design intentions. This would assist them to adopt fair processes in the design of AI-based healthcare technologies. Moreover, the AI intervention must provide clear explanations of how it makes its algorithmic decisions and align with local norms and values to make it acceptable and applicable across diverse communities. These can be realized through the adoption of culturally sensitive approaches to data collection which involves social engagement and partnership with community stakeholders who are indigenous to the traditional values and norms of the people. One of the benefits of the technique is that it will stimulate community-driven actions and foster participatory design throughout the AI development lifecycle. In addition, fairness can be achieved through the utilization of

healthcare datasets that represent the diverse demographics of the African population (age, gender, socioeconomic status, and geographic location), and regular audits of the algorithms to identify and address potential biases. Our findings agree with previous studies which reveals that justice and fairness demand AI technologies to be consistent with the prevailing social and communal ethics and promote equality, and (non-)discrimination to eliminate the negative consequences on the moral values and human rights of the people (Floridi et al. 2018). Employing these approaches to mitigate bias and ensure fairness in AI algorithms – promoting the development of socially-responsive user interfaces for the AI-based solutions that are trustworthy, reduce health disparities, and are inclusive and accessible to diverse users.

**4.3.5 Respect:** Respect emphasizes admiration and deference. It benefits every stakeholder in the healthcare and motivates positive health-seeking behaviours and desirable outcomes. Considering that “respect” is a cultural value in Africa, implementing respect in AI-based healthcare technology would ensure that it promotes the dignity, and respects the rights, cultural norms, and preferences of individual users. Respectful AI system should prioritize privacy and data protection for its users as a way of respecting their autonomy over their health information. This would involve explicit consent seeking and clear communication of the purposes of data collection, storage, and use, and seek explicit consent from users. Incorporating these functionalities into an Afrocentric trustworthy AI technology for health will ensure that the human rights of the patients are protected, and any form of harm is avoided. This is important because research has shown that privacy and data protection are topical issues that affect the credibility of user-centred technologies (Floridi 2019). For example, an AI system that discriminates against the beliefs and culture of the community and does not acknowledge the traditional values of the potential users would not be considered respectful AI – rather it will be a turn-off resulting to system abandonment. Research has shown that culture plays an important role in technology adoption and utilization in many societies (Nkwo, 2019). We posit that implementing these features in AI-based healthcare technology will contribute to promoting trust, and respect, fostering a healthcare environment that values and respects the diverse needs of its users.

**4.3.6 People/Human Centeredness:** People-centred approaches involve community engagement and requires that individuals, patients, and healthcare professionals in our local communities get

involved in the conceptualization, design, implementation, and deployment of the AI. The application of these principles is essential to ensuring that technologies prioritize the healthcare needs, cultural preferences, privacy, and social well-being users. For instance, adopting patient-centred approaches will engender the creation of socially accessible, inclusive, respectful, and customizable interfaces in AI-based telehealth solutions to support individuals with diverse backgrounds, abilities, and levels of digital literacy to access healthcare. This principle also supports the implementation of collaborative features (messaging and feedback mechanism) in the AI-based technologies which help to stimulate shared healthcare decision-making and partnerships among stakeholders. Afrocentric AI-based monitoring solutions that track public health indicators, provide early warning and emergency services must be designed to encourage community participation in data collection and health trend monitoring to contribute to the overall health and wellbeing of the community. However, as good as the implementation of these human-centred approaches in Afrocentric AI solutions are, it should leverage mobile phones, and social media to develop community-driven health literacy campaigns (in local languages and in multimedia formats) that will help people (in remote communities) to understand how AI could be used in efficient healthcare management. The implementation of people/human-centred principles will not only engender collaboration and effective user experience but will also foster trust, respect, acceptance, and active participation of users in realizing their community healthcare goals (Veinot et al. 2013).

**4.3.7 Robustness and Sustainability:** Robustness is synonymous with resilience and reliability. This should be one of the key considerations for creating resilient and effective AI-based healthcare technologies and services in developing continents like Africa as she continues to explore the potentials of AI in pursuing its socioeconomic development and the United Nations Sustainable Development Goals. Robustness can be implemented by prioritizing data privacy/security (by implementing encryption, secure authentication, and access controls) and adapt to differences in infrastructure availability (such as electricity, and internet connectivity) and varying local conditions (such as climate, environment, and resource availability) during design and deployment. Our suggestions agree with previous studies which posits that since the healthcare domain is complex, AI-based technologies for healthcare must be built to adjust to unforeseen situations without compromising its effectiveness (Amugongo et al. 2023).

In addition, sustainability would ensure that relevant socioeconomic, environmental, and ethically responsible AI-based technologies are adopted to promote shared benefits to all stakeholders in the healthcare system and the environment. For instance, due to the unreliable nature of electric supply and internet services across many African nations (Motjoadi and Bokoro 2023), Afrocentric AI developers might want to consider energy efficiency and renewability in designing, implementing, and deploying AI-based healthcare solutions and services that are eco-friendly and resilient. AI developers in Africa must explore the potentials of using locally-sourced materials to create and maintain AI-based healthcare technologies that are sustainable, reliable, and acceptable. These would help to build trust, contribute to improved healthcare and wellbeing outcomes, promote social acceptance of the AI-based healthcare products and services, and enhance user experiences.

## **5. Adoption and Scaling**

In the dynamic healthcare landscape, adopting and scaling Afrocentric trustworthy frameworks is crucial for inclusive and culturally sensitive health solutions. This section explores challenges, opportunities, and strategies for scaling AI health tools in Africa, addressing resistance, promoting adoption, and aligning healthcare with Afrocentric values

### **5.1 Scaling AI Solutions: Strategies for Health Management Tools**

In advancing healthcare with Artificial Intelligence (AI), scaling AI health management tools in Africa is crucial. This section explores strategies for widespread adoption, considering regional nuances, collaborative partnerships, accessibility, and data security:

1. **Regional Considerations:** Scaling AI tools requires understanding regional variations in healthcare, culture, and technology readiness. Tailoring solutions to each region enhances successful adoption (Makoni, 2020).
2. **Collaborative Partnerships:** Crucial for success, partnerships between local healthcare, government, and tech developers ensure culturally relevant solutions aligned with local practices (Ofori-Atta & Osei, 2016).

3. **Accessibility and Affordability:** Essential for diverse socio-economic contexts, ensuring accessibility through sustainable pricing and user-friendly interfaces is key (Adisa, 2018).
4. **Data Privacy and Security:** Addressing data concerns is paramount. Robust protection measures and transparent practices build user trust, facilitating tool adoption (Smith, 2015).

Strategies for scaling AI in health management tools pave the way for transformative advancements in African healthcare. Transitioning to adoption, overcoming resistance requires cultural competence, community engagement, education, and sharing success stories. The link between scaling and adoption highlights their interconnected nature, ensuring seamless integration of healthcare technologies. In the subsequent section, we delve into adoption strategies, recognizing their crucial role in shaping healthcare's future across Africa.

## **5.2 Overcoming Resistance: Strategies for Adoption**

Introducing innovative healthcare technologies faces challenges during adoption, notably resistance to change. This section navigates complexities tied to adopting AI health management tools in Africa, aiming to reveal strategies that acknowledge and address challenges, fostering acceptance for transformative healthcare technologies. Overcoming resistance focuses on cultural competence training, community engagement, education campaigns, and sharing success stories:

1. **Cultural Competence Training:** To combat unfamiliarity and distrust, cultural competence training for healthcare providers ensures understanding of Afrocentric values in AI health tools, fostering acceptance (Nkosi & Abiola, 2017).
2. **Community Engagement:** Involving local communities in AI solution development is crucial. Soliciting feedback, addressing concerns, and involving community members in decisions empower acceptance and ownership (Ofori-Atta & Osei, 2016).
3. **Education and Awareness Campaigns:** Targeted campaigns dispel myths and misconceptions about AI health tools. Transparent communication about benefits and functionalities builds trust, encouraging adoption (Duru, 2019).

4. **Testimonials and Success Stories:** Sharing real-world examples builds confidence and trust. Success stories demonstrate positive impacts, making technology relatable and encouraging adoption (Smith, 2015).

The interplay between overcoming resistance and scaling AI solutions is evident, forming a symbiotic relationship. Overcoming resistance is an ongoing process, requiring continuous engagement, communication, and responsiveness to evolving community needs. These strategies provide a roadmap for navigating complexities, fostering AI health tool adoption in a culturally respectful manner, building trust, and contributing to improved health outcomes across Africa's diverse landscape.

### **5.3 Challenges to Adoption and Scaling of AI Health Management Tools**

The integration of AI in health management promises healthcare transformation, yet faces complexities in adoption and scaling across diverse African landscapes. Challenges include cultural diversity, limited infrastructure, economic disparities, data privacy concerns, workforce readiness, and resistance to change. This section navigates these intricacies, shedding light on factors influencing AI adoption and scaling.

1. **Cultural Barriers:** Diverse African cultures require customised and culturally sensitive approaches for universal AI health management tool adoption.
2. **Limited Technological Infrastructure:** Insufficient infrastructure hampers seamless AI adoption, necessitating investments in development.
3. **Economic Disparities:** Economic inequalities limit access, requiring strategies for affordability and accessibility.
4. **Data Privacy Concerns:** Apprehensions about data privacy demand robust measures to build user trust.
5. **Healthcare Workforce Preparedness:** Varying readiness among professionals necessitates targeted training for technological literacy.
6. **Resistance to Change:** Natural resistance requires a strategic approach fostering acceptance and enthusiasm.

Proactive strategies can overcome challenges, paving the way for successful AI integration. Resistance, a response to innovation, requires thoughtful strategies acknowledging cultural, social, and individual nuances. By navigating these, stakeholders can create an environment supporting seamless AI health tool integration, enhancing healthcare outcomes across Africa's diverse landscape.

#### **5.4 Strategies for Overcoming Resistance to Change**

1. **Cultural Competence Training:** Train healthcare professionals comprehensively to align AI solutions with Afrocentric values, enhancing cultural understanding.
2. **Community Engagement:** Involve communities actively in AI health tool development. Solicit feedback, address concerns, and incorporate local perspectives for acceptance.
3. **Education Campaigns:** Implement targeted campaigns to raise awareness about AI benefits transparently. Dispel myths and foster positive perceptions about improved healthcare outcomes.
4. **Testimonials and Success Stories:** Share success stories and testimonials to humanise AI. Personal narratives build confidence in its efficacy.
5. **Incentivize Adoption:** Introduce incentives for early adopters to motivate broader acceptance of AI solutions.
6. **Pilot Programs:** Initiate pilot programs in select regions to demonstrate tangible AI benefits, fostering trust and encouraging broader adoption.
7. **Addressing Misconceptions:** Proactively address AI concerns through open communication channels. Create dialogue forums for accurate information.
8. **Continuous Training and Support:** Provide ongoing training and support during and after AI tool implementation for healthcare professionals' confidence and proficiency.
9. **User-Friendly Interfaces:** Design AI tools with user-friendly interfaces for easy navigation, accommodating individuals with limited technological literacy.
10. **Regulatory Frameworks:** Establish clear regulatory frameworks addressing ethical concerns, data privacy, and security to build trust in AI technologies' responsible use.

Strategically addressing these challenges can create an environment conducive to successful AI health tool adoption in diverse African landscapes. This not only transforms healthcare delivery but also fosters inclusivity, cultural sensitivity, and overall public health enhancement. Reflecting on these challenges and strategies reveals their profound implications for healthcare's future. The next section emphasises the importance of precise adoption and scaling strategies tailored to cultural, economic, and technological contexts, unravelling the potential for revolutionary healthcare delivery, improved patient outcomes, and sustainable, inclusive health systems.

### **5.5 The Importance of Right Adoption and Scaling:**

Adopting and scaling AI health tools in diverse healthcare landscapes holds immense potential for healthcare revolution. Here are key reasons for their significance:

1. **Improved Healthcare Access:** Enables broader access, especially in resource-limited or remote regions, ensuring advanced healthcare benefits a larger population.
2. **Enhanced Efficiency and Accuracy:** Streamlines processes, reduces administrative burdens, and improves diagnostic accuracy for more efficient healthcare.
3. **Customization to Regional Needs:** Tailors AI solutions to address specific regional healthcare needs, aligning with local practices, cultural nuances, and infrastructure.
4. **Empowerment of Healthcare Providers:** Empowers providers with advanced tools, enabling informed decisions, personalized care, and improved outcomes.
5. **Data-Driven Decision-Making:** Facilitates accumulation of diverse healthcare data for evidence-based decision-making and better public health strategies.
6. **Cost-Effectiveness and Sustainability:** Achieves economies of scale, making AI tools cost-effective and enhancing sustainability.
7. **Global Collaboration and Knowledge Exchange:** Fosters global collaboration, enabling sharing of best practices, lessons learned, and innovative approaches.
8. **Prevention and Early Intervention:** Focuses on preventive measures and early intervention, leading to improved health outcomes and reduced healthcare burdens.
9. **Cultural Sensitivity and Inclusivity:** Afrocentric frameworks ensure cultural sensitivity, recognizing diverse contexts and fostering trust among communities.

The adoption and scaling of these tools usher in an era of accessible, efficient, and culturally sensitive healthcare. By overcoming barriers, tailoring solutions to regional needs, and promoting widespread acceptance, these initiatives transform healthcare systems and improve public health.

## **6: Ethical Considerations and Regulation**

The ethical considerations and regulatory oversight in developing and deploying AI in African healthcare demand careful attention. Key ethical principles for AI adoption in this diverse context include:

1. **Informed Consent and Transparency:** Obtaining informed consent for health data collection is crucial. Transparent algorithms, openly disclosing training processes, build public trust in AI systems.
2. **Bias and Fairness:** Addressing algorithmic bias is vital, given AI mirrors training data biases. Regular audits and adjustments to minimize bias are essential to ensure fairness and prevent discrimination.
3. **Accountability:** Clear mechanisms for accountability are necessary to rectify errors or harms caused by AI technologies. Robust redressal processes must be in place for negative impacts on individuals or communities.
4. **Human Autonomy:** Recognizing AI as a supportive tool, decisions impacting healthcare should remain with human providers. AI should augment, not replace, human expertise and judgement.
5. **Job Displacement:** Responsible AI implementation demands assessing potential job displacement for healthcare workers. Implementing retraining programs and hybrid AI-human workflows can mitigate workforce challenges.
6. **Culturally Sensitive Design:** Aligning AI solutions with cultural norms, languages, and health practices fosters acceptance and engagement within target communities, ensuring resonance with diverse populations.

To integrate ethical considerations into AI deployment in healthcare, robust regulatory oversight is essential. Key approaches include:

1. **Establishing AI Regulatory Bodies:** Creating dedicated national or regional bodies focused on healthcare ensures crafting and enforcing policies for ethical AI use. These bodies oversee compliance, investigate breaches, and adapt regulations to evolving tech landscapes.
2. **Developing Context-Appropriate Guidelines:** Context-specific frameworks, developed through public consultation, align with cultural and ethical values. Inclusive regulation is vital for understanding AI's ethical implications in healthcare.
3. **Mandating Developer Transparency:** Regulatory oversight should compel AI developers to transparently disclose algorithm details, fostering trust and accountability among users, healthcare professionals, and regulatory bodies.
4. **External Audits for Bias Detection:** Mandating independent audits identifies and rectifies biases, promoting fairness in diverse healthcare settings and preventing discrimination.
5. **Stricter Health Data Protection:** Stringent guidelines for data protection must define secure healthcare data collection, storage, and sharing to maintain patient trust.
6. **Creating Adverse Event Reporting Channels:** Establishing reporting channels for AI-related adverse events ensures prompt monitoring and corrective measures, enhancing regulatory responsiveness.
7. **Standards for Clinical Efficacy Testing:** Rigorous testing before AI deployment, guided by regulatory standards, evaluates system performance, accuracy, and safety in real-world healthcare settings.
8. **Multidisciplinary Expertise Integration:** Regulatory processes should include diverse expertise, ensuring comprehensive evaluation of ethical, legal, and societal aspects for informed decision-making.

In summary, a comprehensive regulatory framework, encompassing bodies, transparency, audits, data protection, reporting channels, efficacy standards, and multidisciplinary input, is crucial for ethically deploying AI in healthcare.

## 7. Conclusion, Recommendations and Future Directions

This chapter explores the need for an Afrocentric framework for trustworthy AI in African healthcare, aligning with cultural values. It emphasises ethical considerations in AI application in diverse African healthcare settings. Given Africa's diversity, AI systems must exhibit cultural

sensitivity and adaptability to regional infrastructure, health complexities, norms, and developmental needs. Integration of African values into AI principles, effective collaboration among stakeholders, and user-centric design are crucial for building trust and meeting local needs. While capacity building for healthcare workers on AI literacy and tools is essential for successful implementation without replacing expertise, in addressing data bias, the Afrocentric framework advocates a robust data governance framework to ensure inclusivity, security, transparency, and prevent discrimination. Pilot testing with localised datasets before full-scale deployment aligns AI solutions with Africa's unique healthcare landscape. Hence, policymakers must prioritise ethical AI deployment through clear regulations, digital infrastructure investments, and skills development initiatives. Multi Stakeholder coordination and regional collaborations is required for responsible AI integration in African healthcare. No doubt, involving local communities through the Agile methodology ensures inclusive collaboration, aligning AI solutions with cultural nuances and challenges faced by marginalised groups. As emerging AI trends offer cost-effective solutions, human-centred design with hybrid models is crucial for addressing health worker shortages and improving service access.

The chapter concludes with insights into the future of AI in African healthcare, emphasising indigenous Afrocentric frameworks as transformative guides. The intersection of AI and culturally grounded approaches holds promise in revolutionising healthcare access, quality, and equity. Recommendations for policymakers, healthcare professionals, and AI developers include prioritising ethical considerations, promoting user-centric design, ensuring data governance, and fostering inclusive collaboration. Looking ahead, the trajectory of AI in African healthcare is on a transformative journey, with indigenous Afrocentric frameworks playing a pivotal role in addressing unique healthcare challenges and revolutionising access, quality, and equity. Africa's healthcare landscape is marked by challenges like health worker shortages, limited access, and diverse cultural contexts. However, the convergence of technology and culturally rooted solutions offers opportunities. Upcoming AI trends, such as intelligent diagnostics and predictive analytics, provide hope for addressing healthcare challenges. These technologies can enhance service access, especially in underserved areas, by enabling rapid data analysis for early diagnosis and personalised treatment. Lest we forget that Human-centred design is crucial in this context, requiring AI solutions to align with local knowledge, values, and practices. The development of

hybrid models, combining AI with human expertise and community health workers' insights, offers a transformative approach to address healthcare professional shortages while ensuring culturally competent care.

In addition, ethical considerations, including trust, inclusiveness, and transparency, are paramount in realising the vast potential of AI in African healthcare. Indigenous Afrocentric frameworks emphasize the importance of cultural recognition and respect, fostering trust between communities and AI-driven healthcare initiatives. A balanced approach that integrates African values with global best practices ensures that AI becomes a force for democratising healthcare without compromising cultural relevance. Education and collaboration are essential to empower healthcare professionals with technical skills and cultural understanding. Looking ahead, the role of indigenous Afrocentric frameworks extends beyond technological innovation, fostering a holistic vision that addresses healthcare intricacies, embraces cultural diversity, and empowers communities. The future of AI in African healthcare is about harmonising tradition and technology to create ethical, inclusive, and culturally resonant solutions. Finally, the future of AI in African healthcare involves weaving a tapestry that harmonises tradition and technology, guided by indigenous Afrocentric frameworks. These frameworks offer a blueprint for transformative, ethical, and culturally resonant healthcare solutions across the continent.

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