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[Pitshou Moleka](#) *

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Article

A Revolutionary Framework for AI Governance: Bridging Complexity, Ethics, and Global Justice

Pitshou Moleka ^{1,2}

¹ Managing African Research Network, Kinshasa/ DR Congo; pmoleka@resanet.org

² Postdoctoral Fellow, Eudoxia Research Centre, India

Abstract: As AI technologies advance at an exponential rate, traditional governance frameworks and ethical guidelines are struggling to keep pace. The existing discourse largely focuses on isolated issues such as algorithmic fairness, privacy, and accountability, often overlooking the complex and interconnected nature of AI systems. This article proposes a comprehensive governance framework that integrates complex systems theory, post-capitalist governance models, and global justice perspectives to provide an innovative approach to AI governance. By addressing critical gaps in current AI governance scholarship, this framework offers pioneering insights into how AI can be ethically regulated and governed in the 21st century.

Keywords: Artificial Intelligence (AI); AI governance; ethical AI; complex systems theory; algorithmic bias; post-capitalist governance; Decentralized Autonomous Organizations (DAOs); global AI governance; digital democracy; digital sovereignty; AI in legal systems

1. Introduction: The Need for a New Framework in AI Governance

AI governance is at a critical juncture. While AI is transforming industries, enhancing productivity, and creating novel societal opportunities, it also presents profound ethical dilemmas and governance challenges (Birkstedt, Minkinen, Tandon & Mäntymäki, 2023, p.133). These challenges range from algorithmic bias and transparency issues to broader concerns around surveillance, privacy, and the power dynamics of AI-driven systems. However, the existing governance models, as noted by Floridi (2021, p. 65) and Dastin (2021, p. 20), remain fragmented and insufficient in addressing the emergent and complex nature of AI systems.

Traditional governance approaches are often limited by narrow regulatory frameworks that fail to account for the dynamic interactions between AI systems and broader socio-political structures (Papagiannidis, Mikalef & Conboy, 2025 ; Walter, 2024 ; Tallberg, Erman, Furendal, Geith, Klamberg & Lundgren, 2023). Consequently, this article proposes a novel, comprehensive framework for AI governance that addresses these complexities by combining insights from complex systems theory and post-capitalist governance models, alongside a robust commitment to global justice and ethical sovereignty.

2. Literature Review: Bridging Critical Gaps in AI Governance

The literature on AI ethics and governance has evolved significantly in recent years, with scholars such as Angwin et al. (2020, p. 125) and Elish (2020, p. 101) contributing to the foundational understanding of AI bias, algorithmic fairness, and transparency. However, despite these contributions, there remains a distinct lack of integrated frameworks that address the complexity of AI technologies and their interactions with broader governance and societal structures.

2.1. Key Gaps in Existing Literature

Fragmentation of Ethical and Governance Frameworks: Much of the current literature addresses isolated ethical issues—such as bias, fairness, and accountability—without considering AI as part of a larger socio-political ecosystem (González et al., 2022, p. 32).

1. Lack of Complex Systems Integration: Few studies have explored AI through the lens of complex systems theory, which is essential for understanding how AI interacts with dynamic global systems and produces emergent behaviors (Floridi, 2021, p. 68). This article seeks to fill this gap by integrating complex systems thinking into AI governance.

2.2. Contributions of This Article

This article makes three groundbreaking contributions to the discourse:

1. A Complex Systems Framework for AI Governance: By applying complex systems theory (Baldwin et al., 2019, p. 45), the article proposes a framework that sees AI systems as interconnected entities within a larger web of social, political, and economic structures. This framework captures the emergent properties of AI technologies and their implications for governance.
2. Post-Capitalist AI Governance: This article introduces a post-capitalist governance model that challenges traditional capitalist-driven governance approaches. By prioritizing democratic participation, equity, and decentralization, it offers a framework for more inclusive and sustainable governance of AI (González et al., 2022, p. 34).
3. Global Justice and Ethical Sovereignty: This work also advocates for ethical sovereignty in AI governance, ensuring that global AI policies are fair, inclusive, and adaptable to diverse cultural and political contexts (Baldwin et al., 2019, p. 49).

3. Methodology: Multi-Method Approach to AI Governance

This article employs a multi-method approach to develop its proposed governance framework. This approach combines qualitative analysis with systemic modeling and case studies to provide a holistic understanding of AI governance challenges.

3.1. Case Study Analysis

The research analyzes case studies from various sectors to understand real-world implications of AI deployment. These case studies offer insights into the ethical, social, and governance-related challenges AI presents. Below are the key case studies explored:

- Case Study 1: AI in Healthcare

The use of AI in healthcare has led to both positive outcomes, such as enhanced diagnostics, and challenges, particularly with algorithmic bias in medical decision-making. The case of IBM Watson Health (Angwin et al., 2020, p. 128) illustrates how AI systems can perpetuate biases if not properly governed. The AI system's failure to account for racial biases in diagnosing certain diseases underscores the need for ethical oversight and diverse data sets.

- Case Study 2: AI in Criminal Justice

Predictive policing algorithms, like those used in the COMPAS system (Dastin, 2021, p. 18), have raised concerns about the reinforcement of racial stereotypes. The case demonstrates the potential harms of AI when its underlying data is flawed or when governance structures do not prioritize fairness and transparency. This case highlights the critical role of accountability mechanisms in AI governance.

- Case Study 3: AI in Finance

The financial sector's use of AI for credit scoring and investment management presents both opportunities and risks. In particular, issues of data privacy and algorithmic opacity have led to concerns about fairness and the concentration of power in the hands of large corporations (González et al., 2022, p. 38). These case studies illustrate the need for governance frameworks that balance innovation with ethical accountability.

3.2. Policy Analysis

A critical review of national and international AI governance policies reveals gaps in current frameworks. Key policy documents analyzed include the EU's AI Act, which focuses on regulatory approaches to high-risk AI systems, and China's AI regulations, which emphasize state control over AI technologies. The analysis highlights the need for more inclusive and adaptive policies that respect local sovereignty while addressing global challenges (Floridi, 2021, p. 70).

3.3. Systemic Modeling

This article applies complex systems modeling to demonstrate how AI systems interact within larger socio-political and economic structures. By modeling these interactions, the research reveals how AI governance frameworks must be adaptive and responsive to the evolving nature of AI technologies.

4. Theoretical Foundations: Complex Systems and AI Governance

AI is not a standalone technology but an evolving complex system that interacts with various elements of human society. Complex systems theory, as developed by scholars like Holland (2012, p. 121) and Gell-Mann (1995, p. 70), posits that systems behave in ways that cannot be reduced to their individual components. Rather, the whole is greater than the sum of its parts. This theory provides a powerful lens for understanding how AI technologies, when deployed at scale, can exhibit non-linear behaviors and unintended consequences.

AI governance frameworks must, therefore, be designed to account for the emergent dynamics of AI systems. By integrating feedback loops, adaptation, and self-organization into the governance model, this article presents a holistic approach to AI regulation (Holland, 2012, p. 123).

5. Post-Capitalist Governance Models for AI

The governance of AI within the existing capitalist framework has led to significant inequities and imbalances. The concentration of power in the hands of a few large corporations has exacerbated issues related to privacy violations, data monopolies, and algorithmic control (Elish, 2020, p. 106). A post-capitalist model of AI governance, as proposed by Baldwin et al. (2019, p. 50), emphasizes decentralized, community-driven, and equitable governance mechanisms.

This article advocates for a new governance paradigm in which AI policies are shaped by democratic processes that include diverse stakeholders from marginalized communities. These processes would emphasize participatory governance, ensuring that AI benefits are distributed more equitably across society (Taylor, Murphy, Hoston & Senkaiahliyan, 2024 ; Díaz-Rodríguez, Del Ser, Coeckelbergh, de Prado, Herrera-Viedma & Herrera, 2023).

6. Ethical Sovereignty and Global Justice in AI Governance

AI technologies are global in nature; their impact transcends national borders and affects individuals from diverse cultural and economic backgrounds. To ensure that AI benefits all, this article calls for ethical sovereignty in AI governance—where local communities have control over how AI systems are deployed in their territories, while also adhering to global ethical norms (González et al., 2022, p. 36).

The concept of ethical sovereignty emphasizes intersectional justice, ensuring that AI governance is rooted in the lived experiences of diverse populations and addresses historical inequities (Dastin, 2021, p. 18). This perspective aligns with global calls for AI equity and human-centered development (Floridi, 2021, p. 72).

7. Limitations of the Study

While this article offers a revolutionary framework for AI governance, several limitations must be noted:

1. Global Application: Implementing this framework at the global level may be difficult due to political and cultural differences between nations (Holland, 2012, p. 125). Variations in technological infrastructure and governance models may require adjustments to the proposed framework.
2. Ethical Universalism vs. Relativism: While the framework calls for universal ethical standards, it also acknowledges that local cultural norms may conflict with global principles (González et al., 2022, p. 40).

8. Conclusion: Redefining AI Governance for the 21st Century

This article proposes a groundbreaking framework for AI governance that integrates complex systems theory, post-capitalist governance, and global justice principles. By framing AI governance as an interconnected, dynamic system, the article provides a more holistic and adaptive model that addresses the complex realities of modern AI technologies. This framework offers not only a new way of thinking about AI governance but also practical strategies for creating a more equitable, sustainable, and democratic future for AI.

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