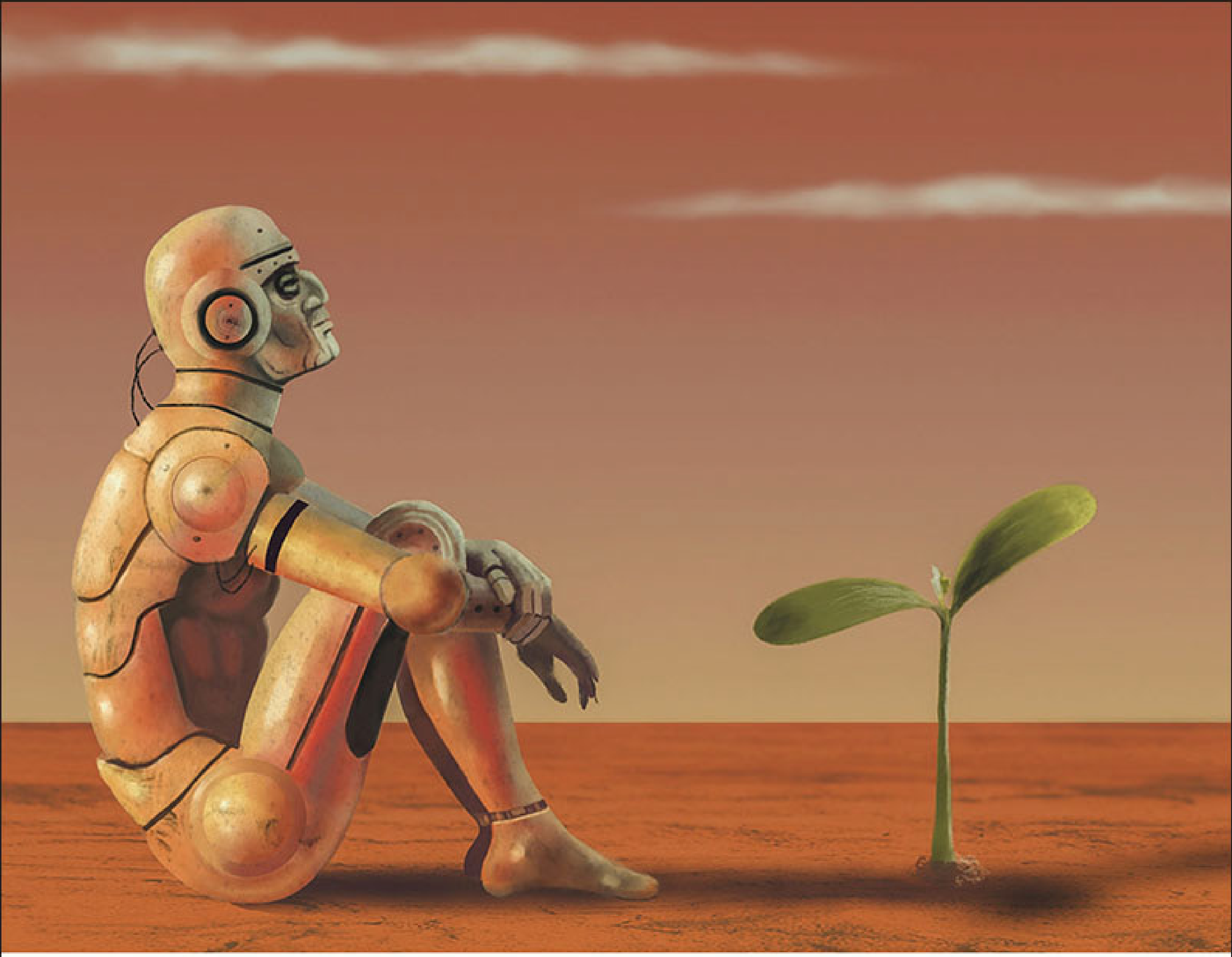

Artificial Intelligence and the Law in Africa

Edited by

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ISBN 978 1 776 17432 4 (softback)
978 1 776 17433 1 (e-book)

Editor: Marj Guy
Technical Editor: Maggie Talanda

PRINTED BY PSG PRINTWORKS

Foreword

The discourse over the promise and peril of Artificial Intelligence (AI) is reminiscent of earlier debates over digital technologies and development. While digital technologies can exacerbate inequalities and widen gaps, they also stand to be capitalised on to promote inclusive development. This paradox is amplified in the case of AI given the pervasiveness, scale and scope of the technology. Indeed, inherent in AI is an extraordinary promise for advancement. Yet, within every component of the technology's construct – data, algorithm, people and infrastructure – lies a trigger for potential inequality and marginalisation.

This especially pertinent in the contexts of compound socio-economic challenges and complex inequalities. These contexts, however, tend to be the very settings where the need for technology and innovation is the strongest. Africa is one such context. Given that, it is imperative to unpack the threats and develop a nuanced narrative for building transformative AI constructs that capitalise on the opportunities, overcome the challenges and fulfil the promise of AI.

Africa is a continent rich in natural and human resources. Nevertheless, many parts of the continent continue to face a host of socio-economic challenges that stand in the way of exploiting the potential of AI for inclusive development. Inequality tops the list of these challenges.

African inequality is complex and multifaceted. Its multi-layers are rooted in engrained disparities. Inequality spreads across gender, race, geography, and ethnic and social backgrounds. It extends beyond income to span inequality of opportunity in access to education, health services, employment, living conditions and active citizenry. Inequality also exists along digital access and use, with digital divides amplifying analogue divides, and intersectionality cutting through realities of minorities and underprivileged groups.

All this stands to be aggravated by AI. Marginalised groups are likely to be disfavoured by the technology on more than one level. Most notably, there is the inaccuracy of the data, AI's primary input, where marginalised communities are invisible to the lens of the national data landscape. Examples are people living in poverty in Cairo's city of the dead, ethnic minorities in Morocco's Western Sahara, and informal settlement residents in Nairobi and Cape Town. Indeed, more than half of the residents of African cities live in informal settlements; their invisibility in national databases means their exclusion from policy making. This also applies to informal workers, constituting more than 80 % of employment in Africa, and specifically in sub-Saharan Africa.

This 'data blindness' excludes those communities from the radar of state relief as well as other policies related to work, entrepreneurship, and financial inclusion, among others. Related to this is the 'data blur' resulting from aggregation that clouds out granular details. An example is data that lacks disaggregation by gender, and this can cause harm if and when used for policies in gender sensitive topics like health and employment.

Many of Africa's informal workers are women and again, the lack of gender-disaggregated data compounds their invisibility. Female informal employment constitutes 92 % of total female employment and 83 % of total female non-agricultural employment in sub-Saharan Africa, including South Africa. These percentages are typically absent from formal employment statistics, and hence, will be absent in any follow-up policies to be informed by this data.

Gender inequality is another layer of Africa's inequity. Even though Africa has impressive growth rates in Internet penetration compared to other parts of the world, it is the only continent where the digital gender gap has increased over the last seven years. While 60 % of African women own a mobile telephone, only 18 % have Internet access, and more than 200 million remain unconnected. The digital gender divide has many layers, including, but not limited to, disparities in skills and opportunities of usage.

African youth also face challenges. One third of Africa's youth aged 15–35 is unemployed, and another third is engaged in vulnerable work. Africa's youth unemployment is twice the rate for adults. Educated African youth also experience high rates of unemployment: 50 % of university graduates in Africa is unemployed annually. These realities have serious implications in the AI age, especially when considering that Africa is the continent with the youngest population across the globe, with half the population under 20 years old, and 40 % aged 15 years and younger (the global average is 25 %).

It is crucial to note the unique demographics of Africa when looking at the future of work given the expansion of AI adoption. Like elsewhere, AI is expected to replace medium- to low -skill jobs, which are abundant in Africa, leaving many without work. Additionally, in the case of Africa, there exists the threat of brain drain of high-skilled workers to elsewhere in the globe, typically the Global North or the Arab Gulf region where AI adoption and expansion have been exponential.

It is thus imperative that policy makers map out the threats and take serious proactive measures to ensure Africa's human resources are capitalised on as an asset and an opportunity rather than a threat. The continent contains a sizable cohort of young university educated men and women. Regulation that prioritises the capitalisation of these human resources should be a priority on the agenda of policy makers. This includes, but is not limited to, establishing an enabling environment and legal landscape conducive to a healthy innovation eco-system, incentivising grounds-up entrepreneurship and encouraging investment in the development of appropriate AI applications that enable and enhance jobs, rather than replace them.

Moreover, labour policies that promote skilling, upskilling and cross skilling of labour force should be high on national agendas, aiming for the retention of skills and turning brain drain into brain gain. This should be coupled by a policy landscape that provides safety nets for those harmed by jobs lost to AI in the short term, while promoting small-scale entrepreneurship and sustainable livelihoods in the medium and longer term. This in turn necessitates developing properly governed national disaggregated data bases that are inclusive and leave no one behind. It is important, too, to foster and promote inclusive and fair AI algorithms that correct biases and prevent future harms, especially those against women as inherent in hiring and credit ratings, among others. A legal framework that addresses all the above is essential.

As it stands, there is a ray of hope for Africa to fulfil the promise of AI for inclusion and move towards achieving the Sustainable Development Goals. Examples are the use of AI in agriculture, health, and the promotion of grounds-up data-driven entrepreneurship and innovation, especially by youth and women; African AI entrepreneurship is on the rise.

There are several examples of such initiatives across the continent: in Cameroon, AgrixTech is an AI startup that helps local farmers to scan their plants and receive sustainable and environmentally friendly treatment solutions via a mobile app that uses machine learning technology; in Kenya, Ilara Health is another AI startup that offers diagnostic services available to over 500 million people in Africa; in Nigeria, DrugStoc is a platform that uses technology and innovations in supply chains to enable safe interfaces between the medical and pharmaceutical communities; and in Nigeria, KiaKia is an AI startup that offers short-term personal and business loans through their easy-to-use loan application expanding access to credit.

Moreover, there has been a ‘feminisation’ of entrepreneurship, where vibrant start-up ecosystems that support women have emerged in Kenya, Nigeria and South Africa while North Africa, too, is catching up. In Morocco’s WaystoCap, for example, we find an ambitious female-led tech start-up that provides a cross-border commerce platform, based in Casablanca.

Africa is moving forward with exploiting the promise of AI for development. The role of the law is instrumental in framing this process. An enabling legal landscape will be crucial in navigating the multiple challenge and exploiting the opportunities. Within such regulation, African realities call for an African centric approach for governing data and AI in a way that maximises the potential of AI, corrects harms and addresses the risks of inequality and marginalisation.

Part of the governance of responsible of data and AI is ensuring innovative data collection and management methodologies with an eye to inclusive and disaggregated data, the development of homegrown algorithms that are sensitive to African communities and realities, as well as taking active measures to upskill women and men in the labour force and ensure safety nets and entrepreneurship opportunities for Africans, especially women and youth.

Most importantly, capitalising on the promise of AI requires a multistakeholder approach, engaging communities from academia, civil society, policy makers, technologies and beneficiaries. The role of interdisciplinary research is instrumental in this process. The current book from African scholars, Artificial Intelligence and the Law in Africa, is a seminal milestone for the way forward in this regard.

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14 December 2023

Preface

The rapid rise in the deployment of artificial intelligence in multiple settings raises interesting legal questions, primarily relating to regulation and mitigation of harm, be it real or merely feared. *Artificial Intelligence and the Law in Africa* brings together several thought leaders who bring different subject field lenses to these questions. Collectively they examine national, sub-regional and regional frameworks regulating artificial intelligence. It is becoming increasingly difficult to consider human flourishing without considering the impact of artificial intelligence in all spheres of human endeavour. These spheres range from employment contexts to agriculture and climate-change adaptation technologies.

The question of potential harms and benefits is a multifaceted one: For instance, if the use of artificial intelligence will cause some harm but deliver great benefits, how are regulators to mitigate the harm while amplifying the benefits? How can regulators best ensure that artificial intelligence does not exacerbate existing inequalities? How can its use be gender sensitive and cater equitably for persons with disabilities?

As we see regulators across the world attempt to regulate artificial intelligence, through legislation such as the EU's Artificial Intelligence Act, African states are mooting how to best approach regulation. This volume provides insight into critical legal questions and suggests appropriate approaches.

The Editors
December 2023

Acknowledgement

The editors acknowledge with deep appreciation the International Development Research Centre (IDRC) for supporting this book by a grant through the Centre for Intellectual Property and Information Technology (CIPIT) Strathmore University under the AI4D project. The publication of the book is also based on research supported in part by the National Research Foundation (NRF) of South Africa (Grant Numbers 132090 and 115716); with Open African Innovation and Research (Open AIR) financial support from the IDRC, Canada, the Social Sciences and Humanities Research Council of Canada, and Queen Elizabeth Scholarship program.

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Contents

Chapter 1

Setting out the challenges and opportunities of artificial intelligence for Africa

1.1 Research context

The definition of artificial intelligence (AI) continues to evolve; at the same time information and communications technologies are developing.[1] Broadly, AI may be regarded as powerful algorithms, machines or computer systems that have over time developed human-like capabilities through techniques, such as machine learning, neural networks, logic programming and fuzzy logic.[2] Through these techniques, AI is trained, aided by big data,[3] to be able to perform tasks that simulate human intelligence. These tasks include learning through experience, identifying patterns, reacting to questions, understanding languages, and solving specific problems.[4]

According to the 2023 Stanford AI Index Report, which is based on 2022 and early 2023 data, the deployment of AI has moved significantly to the era where new large-scale AI models, also recently classified as generative AI,[5] such as ChatGPT-4, ChatGPT, Stable Diffusion, Whisper, and DALL-E 2, are being released every month.[6] The Report further noted that the models are:

> 'Capable of an increasingly broad range of tasks, from text manipulation and analysis, to image generation, to unprecedentedly good speech recognition. These systems demonstrate capabilities in question answering and the generation of text, image, and code unimagined a decade ago, and they outperform the state of the art on many benchmarks, old and new. However, they are prone to hallucination, routinely biased, and can be tricked into serving nefarious aims, highlighting the complicated ethical challenges associated with their deployment.'[7]

It is arguable that the deployment of AI technology offers enormous opportunities for Africa, including wealth creation. AI technology can be deployed to tackle some of the

1 Villani C et al. *For a Meaningful Artificial Intelligence: Towards a French and European Strategy* at 4.
2 Oriakhogba DO 'What if DABUS came to Africa? Visiting AI Inventorship and Ownership of Patent from the Nigerian Perspective' at 89–99; Access Partnership: 'Artificial Intelligence for Africa: An Opportunity for Growth, Development and Democratisation' at 4; Hashiguchi M 'The Global Artificial Intelligence Revolution Challenges Patent Eligibility Laws' at 1–35.
3 Gervais D 'Exploring the Interfaces Between Big Data and Intellectual Property Law' at 3–19.
4 WIPO: 'Technology Trends: Artificial Intelligence'.
5 McKinsey & Company 'What is generative AI'.
6 Stanford University HAI: 'Artificial Intelligence Index Report 2023' (2023 Stanford IA Index Report) at 1.
7 Ibid.

major challenges that Africa faces in areas such as climate change and the environment; energy, oil and gas; agriculture and community empowerment; health technologies and medical diagnostics; intellectual property (IP) production, protection, management and enforcement; protection of traditional knowledge and cultural heritage; information communication technology (ICT) and knowledge curation; banking, finance and their regulation; employment and labour relations; governance, elections and democratic processes; and legal processes and business among others.[8]

Accordingly, despite the on-going academic debate about its nature and effect,[9] the prevailing view is that AI remains among the top five most disruptive technologies[10] and its deployment can produce negative outcomes as well as raise accountability and ethical questions about its use in the context of developmental states. The use of AI technology can promote gender and racial biases, misinformation, echo chambers, fake news and hate speech and arbitrary digital content take-downs, among others, in Africa.[11] Furthermore, the use of AI can promote and deepen social, political and economic inequalities, especially in relation to persons with disabilities, the elderly, children and women; and further widen the digital divide.[12] Specifically, the deployment of AI technology can foster human rights abuses in relation to the right to freedom of expression, access to information and the right to privacy.[13] The use of these technologies also potentially raises serious concerns about data privacy and security and cross-border data flows.[14]

A look at the e-commerce sector is a clear example of the positive and negative effects of AI.[15] The internet brought about the rise in digital advertising and marketing, which are key drivers of e-commerce. Increasingly, AI is now being relied on to drive digital marketing and advertising and starts to replace the notional salesperson. It is used as a tool to process buyer databases, assess consumer behaviours and preferences, and to communicate (as chatbots) with buyers. Apart from the capacity to mislead consumers,[16] AI has the tendency to violate the right to privacy, foster the

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8 See, generally, Barfield W and Pagallo U (eds) *Research Handbook on the Law of Artificial Intelligence*; Stone P 'Artificial Intelligence and Life in 2030: One Hundred Year Study on Artificial Intelligence'; Allianz: 'The Rise of Artificial Intelligence: Future Outlook and Emerging Risks'.

9 See, generally, Pavaloaia V and Necula S 'Artificial Intelligence as a Disruptive Technology – A Systematic Literature Review' at 1102.

10 Other technologies in the category are IoT, blockchain, 5G, and 3D printing. See Pavaloaia and Necula ibid.

11 See, generally, Finlay A (ed.) *Artificial Intelligence, Human Rights, Social Justice and Development*; Adams R *Human Rights and the Fourth Industrial Revolution in South Africa*.

12 Ibid.

13 Adams R 'AI in Africa: Key Concerns and Policy Considerations for the Future of the Continent'.

14 UNCTAD: 'The value and role of data in electronic commerce and the digital economy and its implications for inclusive trade and development'.

15 Malapane TA and NK Ndlovu 'The Adoption of Artificial Intelligence in South African E-commerce Space: A Systematic Review' at 7–12; Kolodin D et al. 'Artificial Intelligence in E-commerce: Legal Aspects'; Bawack RE, Wamba SF, Carillo KDA and Akter S 'Artificial Intelligence in E-commerce: A Biometric Study and Literature Review' at 297–338; Song X, Yang S, Huang Z and Huang T 'The Implication of Artificial Intelligence in Electronic Commerce'.

16 Paterson JM 'Misleading AI: regulatory strategies for transparency in information intermediary tools for consumer decision-making'.

indiscriminate collection of data, and impede data security. In effect, the deployment of AI in e-commerce continues to raise questions about the effectiveness of existing rules relating to the collection and processing of data, and the guarantees of privacy rights. As such, countries, especially in Africa, are seeking to develop national AI policies to serve as a basis for formulating appropriate rules to guide the use of AI in e-commerce.[17]

Global investment in AI technology continues to show great potential for growth and the market (including AI software, hardware and services) is growing rapidly. From existing reports, the global AI investment in 2022 was USD91.9 billion,[18] and this is anticipated to grow to USD500 billion in 2024, and further predicted to record USD15.7 trillion in investment by 2030.[19] AI investment in 2022 focused more in the areas of medicine and healthcare, data management, processing and cloud, and Fintech.[20] From the reports, countries in the Global North (especially North America) and China, with huge investment in AI-related research and development (R&D), deployment and acquisition, continue to dominate the market.[21] This is evidenced by the huge presence and investments of the Global North and Chinese tech-giants such as Google, Twitter, IBM, Microsoft, Baidu, Facebook, among others, in different parts of the globe, and particularly in Africa. Indeed, there is testament to the fact that the 'AI divide' tilts in favour of the Global North and the social and economic benefits of AI technology have been found to be concentrated in the Global North.[22]

Africa is, however, making some modest strides in AI investment and R&D. For instance, 149 emerging AI hotspots, the majority of which are in academia, have been identified in Africa,[23] while about 10% of the 6500 technology start-ups in Africa plied their trade within the context of the Fourth Industrial Revolution (4IR), including AI technology, as at 2019.[24] Recently, the Nigerian government launched Africa's first AI-powered humanoid robot (named Omeife). According to the developers, the robot is trained with data that makes it capable of being used in different economic sectors in Nigeria.[25] Also, the 'AI sector in Africa received about USD17.5 million in government and private sector investments in 2019.'[26] Investment in the AI sector in Africa is bound to grow bigger with the increasing awareness on the part of governments in Africa and the partnerships being built with big tech corporations and countries in the Global North.[27]

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17 WTO: 'Digital connectivity, e-commerce and sustainable trade'.

18 2023 Stanford AI Index Report at 13.

19 PWC: 'Sizing the prize: What's the real value of AI for your business and how can you capitalise?'

20 2023 Stanford AI Index Report at 13.

21 Ibid.

22 Yu D, Rosenfeld H and Gupta A 'The 'AI divide' between the Global North and the Global South'.

23 K4A: 'Global South map of emerging areas in Artificial Intelligence'. See also AI4D: 'Artificial Intelligence in Sub-Saharan Africa: A Compendium Report'; Gwagwa A et al. 'Artificial Intelligence (AI) Deployments in Africa: Benefits, Challenges and Policy Dimensions'.

24 Shearer E, Stirling R and Pasquarelli W *Government Artificial Intelligence Readiness Index 2020* at 83.

25 Dosunmu D 'Inside Africa's first humanoid'.

26 Ibid.

27 Raji R 'Africa wakes up to the potential of artificial intelligence: How Singapore can stake a claim and take advantage of untapped opportunities'.

Undoubtedly, with appropriate legal and policy frameworks both at national and regional levels, that will enable the development of Africa's digital infrastructure, digital literacy and know-how, Africa will be able to seize the opportunities, and overcome the challenges, of AI. Indeed, with the promotion of the regional trade, socio-economic integration, technological advancement,[28] which the African Continental Free Trade Area (AfCFTA) Agreement heralds,[29] the deployment of AI will enable Africa to capture about '10% of the fast-growing AI market forecasted to reach about USD15.7 trillion by 2030'; increase the continental economy by USD1.5 trillion; and promote rule of law and sustainable development.[30]

Recognising the impact of AI on society, different policy, and normative fora both at national, regional and global levels are taking steps to shape policy and regulation regimes in order to seize the opportunities and address the challenges which AI presents.[31] Some of the steps have led to national strategies, draft policies and regulation frameworks currently open for deliberations and consultations. For instance, informed by its white paper on AI and related public consultations,[32] the European Commission is proposing a broad-based regulation of AI within the European Union (EU).[33] The key objectives of the proposed regulation are to 'ensure that AI systems placed on the Union market are safe and respect existing law on fundamental human rights and Union values'; 'ensure legal certainty to facilitate investment and innovation in AI'; 'enhance governance and effective enforcement of existing law on fundamental rights and safety requirements applicable to AI systems'; and 'facilitate the development of a single market for lawful, safe and trustworthy AI applications and prevent market fragmentation'.[34]

On its part, the Council of Europe is currently working on developing a convention on AI, human rights, democracy and the rule of law. It recently published a draft framework convention that will inform negotiations by its member states through its Committee on AI.[35] When negotiated and adopted, the convention will principally

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28 ECA: 'UN forum unveils the wonders of artificial intelligence and other STIs for Africa'.

29 See the Agreement Establishing the African Continental Free Trade Area, 2018.

30 ECA: 'UN forum unveils the wonders of artificial intelligence'

31 E.g., European Commission: 'White Paper on Artificial Intelligence – A European approach to excellence and trust'; European Commission: 'Consultation: White Paper on Artificial Intelligence – A European approach to excellence and trust'; Australian Government: 'Australia's AI Action Plan'; Government of Canada: 'Responsible Use of Artificial Intelligence (AI)'; WIPO: 'Artificial Intelligence and Intellectual Property Policy'; WIPO: 'Revised Issues Paper on Artificial Intelligence and Intellectual Property Policy'; UK Department for Science, Innovation & Technology: 'A Pro-Innovation Approach to AI Regulation'; GOV.UK: 'Consultation Outcome – Artificial Intelligence and Intellectual Property: Call for Views'; USPTO: 'Public Views on Artificial Intelligence and Intellectual Property Policy'.

32 European Commission: 'White Paper on Artificial Intelligence'.

33 European Commission: 'Proposal for a Regulation of the European Parliament and the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts'.

34 Ibid. at 2.

35 Council of Europe: 'Revised Zero Draft [Framework] Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law'. The draft has been further revised and consolidated with other related proposals. See Council of Europe: 'Consolidated Working Draft Framework Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law'.

establish 'fundamental principles, rules and rights' that will ensure that the 'development and application of artificial intelligence systems is fully consistent with respect for human rights, the functioning of democracy and the observance of rule of law.'[36]

Furthermore, on 23 November 2021, member states of the United Nations Educational, Scientific and Cultural Organisation (UNESCO), including African countries, adopted the Recommendation on the Ethics of AI to address the AI-related ethical issues falling within the UNESCO mandate.[37] The Recommendation proffers a 'basis to make AI systems work for the good of humanity, individuals, societies and the environment and ecosystems, and to prevent harm'; 'enable stakeholders to take shared responsibility based on a global and intercultural dialogue'; and 'aims at stimulating the peaceful use of AI systems.'[38] Furthermore it brings about a 'a globally accepted normative instrument that focuses not only on the articulation of values and principles, but also on their practical realisation, via concrete policy recommendations, with a strong emphasis on inclusion issues of gender equality and protection of the environment and ecosystems.'[39] These measures are geared towards providing, among others, 'a universal framework of values, principles and actions to guide States in the formulation of their legislation, policies or other instruments regarding AI, consistent with international law'; and promoting 'equitable access to developments and knowledge in the field of AI and the sharing of benefits, with particular attention to the needs and contributions of LMICs, including LDCs',[40] which are prevalent in Africa. In this connection, the Recommendation approaches the ethics of AI

> '[a]s a systematic normative reflection, based on a holistic, comprehensive, multicultural and evolving framework of interdependent values, principles and actions that can guide societies in dealing responsibly with the known and unknown impacts of AI technologies on human beings, societies and the environment and ecosystems, and offers them a basis to accept or reject AI technologies. It considers ethics as a dynamic basis for the normative evaluation and guidance of AI technologies, referring to human dignity, well-being and the prevention of harm as a compass and as rooted in the ethics of science and technology.'[41]

Given its main thrust, which is the development and deployment of responsible AI, especially within the context of human rights, implementation of the Recommendation through appropriate regulation, will support the utilisation of AI systems for the curbing of human rights abuses by states and non-state actors in Africa.[42]

In the 2019 *Government Artificial Intelligence Readiness Index* published by the International Development Research Centre (IDRC) and others, Rutenberg concluded that the 'outlook for AI in Africa is positive in that there is growing interest in the topic from

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36 Council of Europe: 'Revised Zero Draft [Framework] Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law' art. 1.

37 UNESCO: 'Recommendation on the Ethics of Artificial Intelligence' (UNESCO Recommendation).

38 UNESCO Recommendation at 14.

39 Ibid.

40 UNESCO Recommendation at 14 and 15.

41 UNESCO Recommendation at 10.

42 On the nexus between AI and human rights protection, see Abe O and Akinyi JE 'Regulating artificial intelligence through a human rights-based approach in Africa' at 425–448; Ojo OO 'The emergence of artificial intelligence in Africa and its impact on the enjoyment of human rights' at 326–350

formal research centres and informal developer communities'.[43] However, according to Rutenberg, governments 'across Africa will need to develop coherent and strong policies around AI if they are to capitalise on these recent developments, and ensure their citizens benefit from the advantages of AI whilst being protected from its potentially harmful impacts'.[44] Interestingly, countries in Africa are already recognising the potential role of AI in the growth and sustenance of their digital economy. As such, the development of AI technology is being included as an important element in their economic and development strategies.[45] Also, think-tank institutes and centres are being developed by national governments, in collaboration with private organisations, to harness the benefit of AI for national development.[46] Even so, the 2020 *Government AI Readiness Index*, indicates that African countries still 'have less capacity in relation to the size of the technology sector, the business environment and existence of a skilled AI workforce'. Furthermore, 'there is [still] limited preparation of appropriate regulatory and ethical frameworks'[47] for AI in Africa.

The 2021 UNESCO Survey involving 32 African countries corroborates the abovementioned.[48] In particular, the survey found that there is a need to strengthen policy initiatives, foster legal and regulatory mechanisms, and enhance capacity for AI governance in Africa. It also recognised the need for cooperation among African countries in key priority areas, such as 'personal data protection and data governance', 'leveraging AI for economic growth, development and digital transformation', updating education, skills and training systems', and the facilitation of AI R&D. Finally, the survey advocated for actions to address the 'ethical implications of AI systems', the 'implications of AI for cultural diversity', and 'gender biases in the development and use of AI system(s)' in Africa.[49]

There is a growing need for capacity building, and policy and regulatory intervention on AI at the African regional policy and norm-setting fora. The African Union (AU) adopted the African Digital Transformation Strategy in February 2020,[50] the objective of which includes building inclusive digital skills and human capacity in emerging digital technologies, such as AI.[51] The strategy recognised the creation of 'an enabling

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43 Miller H and Stirling R *Government Artificial Intelligence Readiness Index 2019* at 11.

44 Ibid.

45 E.g., Mauritius, Rwanda, South Africa, Tunisia, Kenya, Egypt: see Shearer, Stirling and Pasquarelli. See also Petheram A and Rahim S *Government AI Readiness Index 2021* at 44–47; South African Government: 'Report of the Presidential Commission on the Fourth Industrial Revolution'; Nigeria Federal Ministry of Communications and Digital Economy: 'National Digital Economy Policy and Strategy (2020–2030): For a Digital Nigeria' at 35.

46 E.g., Nigeria has created the National Centre AI and Robotics (NCAIR) as a special vehicle of the National Information Technology Development Agency (NITDA) for the promotion of R&D in emerging technologies and their application in areas of national interest to Nigeria: <https://nitda.gov.ng/ncair/>. Also, based on the recommendations in the report of the Presidential Commission on the 4IR, the South African government, in conjunction with the University of Johannesburg and Tshwane University of Technology, recently established the AI Institute of South Africa: <https://aii-sa.co.za/home-2/>.

47 Shearer, Stirling and Pasquarelli.

48 See also UNESCO: 'Landscape study of AI Policies and use in Southern Africa: Research Report'; CIPIT: 'State of Artificial Intelligence in Africa 2023 Report'.

49 UNESCO: 'Artificial Intelligence Needs Assessment Survey in Africa'.

50 AU: 'The Digital Transformation Strategy for Africa (2020–2030)'.

51 Ibid. at 3.

environment with policies and regulations that promote digital transformation' as a strong pillar for achieving its objectives. Conceptually, the AU noted the importance of being prepared for Africa's digital transformation and emerging technologies, such as AI, and the need for 'policy makers and regulators . . . to keep pace with advances in the [emerging] technolog[ies], address the new regulatory frontiers and create the foundation upon which digital transformation can achieve its full potential'.[52] According to the AU, such 'public policy, legal and regulatory frameworks need to be up-to-date, flexible, incentive-based and market-driven'.[53] In addition, recognising the impact of AI, robotics and emerging technologies on civil, political and socio-economic rights in Africa, the African Commission on Human and Peoples' Rights (ACHPR), through its resolution of February 2021, made a strong call for a study on AI, robotics and emerging technologies, and human and peoples' rights in Africa.[54] This was followed by the AU Development Agency (AUDA-NEPAD), through its High-Level Panel on Emerging Technologies (APET). Specifically, the AUDA-NEPAD convened an expert consultative meeting for the development of a continental AI strategy in Africa.[55] The strategy would 'enable African countries to enhance policymaking and implementation and improve stakeholder engagements on AI-related challenges and opportunities'.[56] Importantly, the 'strategy can help African countries comprehensively develop AI-related technology products and services within various economic sectors and also model how African countries could improve data security and safeguard [AI] technology through enabling regulatory frameworks'.[57]

It is noteworthy that APET had already concluded a study and produced a report on AI for Africa: Artificial Intelligence for Africa's Socio-economic Development.[58] The report was launched at the 36th AU Ordinary Summit that took place from 18 to 19 February 2023 in Addis Ababa, Ethiopia.[59] The report shows that harnessing AI technology, through appropriate regulation regime, can significantly contribute to Africa's socio-economic development and reduce poverty on the continent.[60] The report identified healthcare, mining, energy, agriculture, and financial and public services, as the key sectors in which the deployment of AI technology, supported by the appropriate and progressive legal, policy and ethical frameworks, can significantly contribute to the economic growth and development of Africa.[61]

These efforts provide the basis for, and offer an opportunity, to reflect, from a broad policy and legal perspective, on the diverse aspects over which AI presents the challenges in Africa. They also help in policy and legal reformulation that will enable Africa

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52 Ibid.
53 Ibid. at 7.
54 ACHPR: 'Resolution on the need to undertake a Study on human and peoples' rights and artificial intelligence (AI), robotics and other new and emerging technologies in Africa'.
55 AUDA-NEPAD: 'The African Union Artificial Intelligence Continental Strategy for Africa'.
56 Ibid.
57 Ibid.
58 AUDA-NEPAD: 'AI for Africa: Artificial Intelligence for Africa's Socio-economic Development'.
59 AUDA-NEPAD: 'The African Union Artificial Intelligence Continental Strategy for Africa'.
60 See NEDAP: 'Tweet of 18 February 2023'.
61 AUDA-NEPAD: 'AI for Africa' at 1. See also Sedola S, Pescino AJ and Greene T *Artificial Intelligence for Africa*.

to seize the opportunities and resolve the challenges of AI within the continent. However, a suitable understanding of the challenges and opportunities AI presents for Africa, as well as the contextual characteristics existing on the African continent, is necessary in order to formulate an appropriate legal framework that will enable Africa to take advantage of the opportunities of AI and address its challenges on the continent.

1.2 Research of objective and questions

This book brings together a collection of well-researched, well-structured, well-written and peer-reviewed chapters from seasoned experts and researchers in the field of AI and the law in Africa. As the discussion in 1.1 above demonstrates, there is a growing body of literature in the form of journal articles, official reports, blogs, among others, focusing on specific aspects of AI in Africa. However, a more authoritative resource that proffers broad legal and policy recommendations on how Africa can seize the opportunities and overcome the challenges of AI on the continent, and which interrogates the general aspects of the African society implicated by AI technology, is lacking. Key literature on AI and the law focus on the issues within the context of other jurisdictions outside Africa,[62] except for Adams,[63] who looks at the human rights issues implicated by the 4IR from a South African perspective; Mazibuko-Makena and Kraemer-Mbula,[64] who explore African perspectives within the broader context of the 4IR; Eke et al. who focus on considerations for developing responsible AI systems in Africa;[65] and Corrigan et al., who focus on the strategies for resolving the challenges of incorporating concerns of AI ethics into tertiary education curriculums for future AI developers in Africa.[66] Accordingly, this book will make recommendations on law and policy options that will enable Africa to take advantage of the opportunities, and overcome the challenges of AI, on the continent. In this connection, the chapters will be

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62 Quintavalla A and Temperman J (eds) *Artificial Intelligence and Human Rights*; Castets-Renard C and Eynard J (eds) *Artificial Intelligence Law: Between Sectoral Rules and Comprehensive Regime Comparative Law*; Bennun ME (ed.) *Computers, Artificial Intelligence and the Law*; Bennun M and Narayanan A (eds.) *Law, Computer Science and Artificial Intelligence*; Martin-Bariteau F and Scassa T (eds) *Artificial Intelligence and the Law in Canada*; D'Agostino G, Goan A and Piovesan C (eds) *Leading Legal Disruption: Artificial Intelligence and a Toolkit for Lawyers and the Law*; Turner J *Robot Rules: Regulating Artificial Intelligence*; Corrales M, Fenwick M and Forgó N *Robotics, AI and the Future of Law*; Berk R *Machine Learning Risk Assessments in Criminal Justice Settings*; Calo R, Froomkin AM and Kerr I (eds) *Robot Law*; Wischmeyer T and Rademacher T (eds) *Regulating Artificial Intelligence*; Chesterman S *We, The Robots? Regulating Artificial Intelligence and the Limits of the Law*; Kurki VAJ and Pietrzykowski T *Legal Personhood: Animals, Artificial Intelligence and the Unborn*; Barfield and Pagallo; Findley M, Ford J, Seah J and Thampapilai D *Regulatory Insights on Artificial Intelligence: Research for Policy*; Mantelero A *Beyond Data: Human Rights, Ethical and Social Impact Assessment in AI*; Abbott R *Research Handbook on Intellectual Property and Artificial Intelligence*; Abbott R *The Reasonable Robot: Artificial Intelligence and the Law*.

63 Adams *Human Rights and the Fourth Industrial Revolution in South Africa*.

64 Mazibuko-Makena Z and Kraemer-Mbula E (eds) *Leap 4.0: African Perspectives on the Fourth Industrial Revolution.*

65 Eke DO, Wakunuma K and Akintoye S (eds) *Responsible AI in Africa: Challenges and Opportunities.*

66 Corrigan CC et al. (eds) *AI Ethics in Higher Education: Insights from Africa and Beyond*.

specifically structured towards addressing the following broad questions from both a regional and country-specific context:

- What are the challenges and opportunities of AI generally, especially to law and policy, in Africa?
- What contextual characteristics exist in the African continent that would result in, or necessitate, unique policy frameworks compared with situations elsewhere?
- Do legal and policy frameworks already exist in Africa that enable Africa to take advantage of the opportunities, and overcome the challenges, of AI on the continent?
- If the answer to the above is in the negative, which legal and policy options will enable Africa to take advantage of the opportunities, and overcome the challenges, of AI on the continent, and how can the legal and policy frameworks be developed?

1.3 Research methodology

A discussion of research methodology concerning AI generally depends on the perspective from which AI is viewed. From the field of computer science, the methodology adopted depends on whether the research is geared towards developing AI technology (research in AI) or whether the research is deploying AI as a tool in the investigation (AI research). From the literature, research in AI would generally adopt the machine learning techniques, which includes artificial neural networks, logic programming, fuzzy logic, Bayesian methods, genetic algorithms, support vector-machines, and K-means, among others.[67] On the other hand, AI research relies on methods such as content and text analytics, and data modelling, among others.[68] Nonetheless, research in AI and AI research share a common feature since they both rely on big data regardless of the method adopted.

There is a third perspective on research methodologies concerning AI, which stems from AI's evolving nature and its linkage with other fields of endeavour such as ethics, medicine, psychology, business, and law, among others: research about the impact of AI on other fields. AI impacts, and is impacted, by different fields of endeavours. For instance, AI continues to challenge some foundational legal principles, such as ownership and personhood, just as there are on-going conversations around, and research, about the most effective approach to developing normative frameworks for AI. Gleaned from the literature, research about AI adopts different methodologies depending on the objective of the research. For instance, research on AI in the field of law is either conducted as doctrinal research or literature review, or as socio-legal research,[69] which

67 Richie GD and Hanna FK 'AM: A case study on AI methodologies' at 249–268; Hall RP and Kibler DF 'Differing methodological perspectives in artificial intelligence research' at 166–178; Serey J et al. 'Artificial intelligence methodologies for data management' at 2040; Bawack RE, Wamba S and Carillo KD 'A framework for understanding artificial intelligence research: insights from practice' at 645–678.

68 See, e.g., Van Cuilenburg JJ, Kleinnijenhuis J and De Ridder JA 'Artificial intelligence and content analysis: problems of and strategies for computer text analysis' at 68–97; Sarker IH 'AI-Based Modelling: Techniques, Applications and Research Issues Towards Automation, Intelligent and Smart Systems' at 158–177; Moreno A and Redondo T 'Text analytics: the convergence of big data and artificial intelligence' at 57–64.

69 See, e.g., Gerards JH et al. *Getting the Future Right: Artificial Intelligence and Fundamental Right*; Rosca C et al. 'Return of the AI: An Analysis of Legal Research on Artificial Intelligence Using Topic Modelling'.

borrows from social science qualitative research methodologies such as narrative analysis, and document analysis, among others.[70]

This book is an edited volume consisting of chapters contributed by different authors. The chapters address the opportunities and challenges of AI in the field of law covering different themes and drawing from the national experiences within Africa. The themes addressed by the chapters include human rights, gender equality, data governance, privacy concerns, democracy and civic participation, e-commerce and regional trade, digital credit, IP, health and medical diagnostics, innovation, ICT and knowledge curation, labour regulation, legal ethics, legal process and business, energy and mining, agriculture and food security, climate change and environmental regulation, traditional knowledge systems and cultural heritage. The concluding chapter of the book draws its recommendations and conclusions from the chapters contributed.

1.4 Structure of the book

The book consists of 16 chapters, including this chapter. Adopting the narrative approach, chapter 2 examines the impact of law and policy in the emerging realm of AI governance in South Africa with specific focus on questions around gender. In this regard, the chapter takes note of the on-going conversations around the 4IR and how the debates have elicited the need for a policy and regulatory mechanism for the governance of AI technologies and machine-learning, especially within the African context. Using South Africa as the jurisdictional focus, the chapter examines the 2020 South African Report of the Presidential Commission on the 4IR (PC4IR), with particular attention to gender issues. The chapter critically analyses the PC4IR report and examines South Africa's vision on AI governance with a view to recommending how the visions in the PC4IR can be strengthened to prevent AI technologies from entrenching and promoting gender biases and inequalities in South Africa.

Chapter 3 addresses some of the key connections and tensions between the use of AI and the protection of human rights in Africa. In this connection, it evaluates the budding epistemes on the concept of AI on one hand, as it relates to the concept of human rights from an African perspective. The chapter then explicates on some of the positive and negative ways that AI affects the advancement of human rights in Africa, on the other hand. This dualist analysis is to reveal some of the ways that AI can either augment or diminish the realisation of human rights in Africa. Following this, the chapter examines some legal and regulatory responses to AI from a human right perspective, particularly focusing on how the use, development and deployment of AI can align with the normative frameworks on human rights in Africa.

Chapter 4 zeroes in on AI and data governance in Africa. It examines Africa's readiness to adopt AI-backed technologies to meet some of its developmental objectives and the goals articulated in the Digital Transformation Strategy for Africa. In this regard, the chapter details the usefulness of AI technologies to developing countries, such as in Africa, by looking into the spaces in which AI-backed technologies could have the biggest positive impact as well as detailing any shortcomings or negative effects that

70 For a study of these social science research methodologies, see Wright JD (ed.) *International Encyclopaedia of Social and Behavioral Sciences: Reference Work*; Bowen GA 'Document analysis as a qualitative research method' at 27–40.

this may have. The chapter then interrogates the state of policy and law on the continent in relation to the three key areas that affect quality of data: that is to say data availability, data interoperability, and data integrity and security. These discussions are geared towards answering the question of whether the current legal and policy environment on the African continent supports the creation, movement, usability and security of data which will ultimately determine the effectiveness of the use of AI in Africa. The chapter points out key policy areas that need re-imagining or reinforcing to better support the adoption of AI technologies in Africa.

Chapter 5 commences by conceptualising democracy as a political system of governance that is based on the will of the people, as well as on values such as popular participation, respect for human rights, transparency and government accountability. It then acknowledges the increasing and evolving relevance and application of AI in political processes, including elections and public policy consultations, which has reached advanced stages in Global North countries. The chapter then situates the conversation on the potential impact of AI on democracy within the African context. It does so by providing an overview on the global trends on the use of AI in political processes, and the impact that such technology is having on democracy. Based on available African anecdotal examples, the chapter makes an indicative assessment on the potential impact of AI on democracy in Africa and recommends strategies to ensure that the introduction of AI in political processes in Africa will enhance rather than undermine democracy.

Chapter 6 examines the impact of gender bias in AI consumer digital credit transactions. It discusses how bias is introduced into AI systems through algorithmic learning that is based on prejudiced human inputs, and through societal bias in the media or unrepresentative training datasets, resulting in discrimination based on gender, among other things. The chapter further explores the impact of human-generated AI biases on consumer lending using a gender lens, particularly given the importance of access to credit for women. The chapter reveals that even in situations where companies make the effort to utilise seemingly neutral data, gender alternates, such as career choices and nuances in language usage, can identify and categorise female borrowers with the potential to usher in adverse impacts. The chapter then examines the unintended consequences of this situation and the difficulty with regulating AI, especially within the context of consumer digital credit. The chapter details some insights for navigating the AI gender bias challenge in consumer digital credit with the aim of fostering fair lending irrespective of gender.

Examining the interface between IP and AI, from an African context, chapter 7 notes that AI is often viewed either as an object or a subject. As an object, AI is regarded as a tool used in the creative and innovative process and does not require any special IP protection in and of itself. As a subject, the argument is to extend the kind of protection humans have under the IP system to AI. However, while the chapter argues that IP protection would be available for AI systems, it implies that the IP system is more than just IP protection. The chapter argues, in other words, that the IP system, especially when viewed through the lens of regional and national development objectives, embodies other components that may be better placed to harness the opportunities and overcome the challenges of AI on the continent. Specifically, the chapter is premised on the argument that the use of the IP system to take advantage of the opportunities, and overcome the challenges, of AI in Africa should be based on the recognition of the contextual characteristics that exist in the continent as embodied in expressed development plans.

The exploration of the use of AI, in the context of health care delivery, has particularly been about better health diagnostics as well as regarding better data management. The advancement of AI as a helpful innovation in health care is championed by innovators looking to disrupt and improve on existing ways of doing things for the purpose of increasing profit. Also, health administrators deploy AI for innovation in the context of health care to maximise limited resources for better health outcomes. In this meeting of the profit incentive with the health-centred desire is the notion that AI can serve as a useful tool for fast tracking sustainable human development.

Chapter 8 examines the emerging health-care sector related AI innovations, their application, and the challenges they pose. It argues that, while the potential for AI in Africa is far reaching, without the necessary infrastructural, legal, and regulatory systems in place, AI in healthcare in Africa runs the risk of becoming a flight of fancy at best with limited benefit for the millions of people in dire need of quality health care or worse still, an outlet for the replication of existing structural racial, gender and economic inequities.

Using Kenya as its jurisdictional focus, chapter 9 seeks to determine the extent to which current AI practises aid and hinder the collation, preservation, and dissemination of indigenous knowledge, the possible impacts of such practices on the cultural and commercial applications of indigenous knowledge, and the relevant ethical and policy considerations to ensure the inclusion, preservation, and access to IK where AI is deployed in the collation of indigenous knowledge. To resolve these questions, the chapter interrogates the diverse role of indigenous knowledge to the development of Kenya's economy, and the laws and policies that will be appropriate and effective in ensuring the ethical utilisation of AI within the context of the collation, preservation and dissemination of indigenous knowledge in Kenya.

The regulatory systems that constitute labour law are constructed dynamically, requiring development and new articulations and revisions as the law interacts with technological advancements, including the use of AI technologies, which impact on employment, working arrangements, and how work is performed, especially in the African context. It is, therefore, important that law and policy interventions regulating AI – as a general-purpose technology (GPT) – must be balanced to mobilise the benefits that flow from the automation of work and work processes, while at the same time managing the quantitative and qualitative risks associated with the deployment of AI technologies in Africa. Chapter 10 unpacks these issues and recommends innovative and human-centred regulatory strategies that will provide valuable guidance for the use of AI in the workplace and in the world of work within the African context.

Exploring the opportunities and challenges that AI portends for the legal industry in Africa, chapter 11 suggests that legal professionals in Africa, in contrast to those in developed Global North countries, are generally hesitant and even fearful of the changes that technology brings, and will continue to be hesitant in adopting it without being fully capable of deploying the technology to their trade. At the same time, the endemic infrastructural problems and resource constraints in Africa make a technology-driven legal system look like something more reflective of science fiction than fact. Thus, it is hard to take concepts like AI seriously as a real disruptor of the legal industry since the legal system includes courts that lack access to basic resources such as the Internet, mobile networks or even an uninterrupted electricity supply. It is even harder to promote futuristic legal-tech solutions that promise to bring access to justice to the general population in Africa when one considers that only half of that population owns a mobile phone that can access the Internet. Moreover, equity gaps in access to the

Internet add a sinister layer of injustice to the picture, and the fact that most AI tools originate in the Global North brings the spectre of colonial dominance with it. Unpacking these issues, the chapter determines how the promised benefits of AI within the context of the legal process and business may be made available to all regardless of socio-economic status in Africa.

Linked to the discussion in chapter 11, chapter 12 focuses on AI and legal ethics in Africa, with particular focus on Egypt, Kenya, Uganda, Nigeria, Ghana, Zambia, and South Africa. In this regard, it acknowledges the unavoidable similarities between the rules of legal ethics in Africa and those Global North countries as the contribution of colonialism to the African legal system. In effect, the rules of legal ethics, which are codes that play a significant role in helping to develop and sustain high moral standards among lawyers in Africa, are a representation of the Dutch, Roman, civil, and English legal traditions transplanted in Africa by colonial overlords. More broadly, the rules of legal ethics regulate issues around qualifications for practising as an advocate and/or solicitor, ethical and professional standards required of an advocate as well as rules around misconduct. Essentially, the chapter examines opportunities for applying AI to the implementation of the rules of legal ethics to sustain high moral standards among lawyers in Africa and the possible challenges that may be encountered in this regard.

Chapter 13 addresses the legal and regulatory framework of AI in the African energy and mining industries, including some of the approaches and solutions that governments are either already taking or have envisaged, to develop meaningful legislation. It proceeds on the premise that despite digital transformation being widely touted as a game-changer for the energy and mining industries, the present legal and regulatory frameworks across Africa, especially for AI, either do not envisage or do not provide sufficient regulation to achieve digital transformation. The chapter recognises the great deal of confidence on the continent about the role that AI could play in its growth and development, especially the energy and mining sector, with the right legal and regulatory framework to support the efforts that are being made by research hubs, AI technology companies and start-ups. It then raises and addresses questions about Africa's preparedness for the AI technological revolution and the lack of appropriate legal and regulatory frameworks to regulate it, especially within the context of Africa's mining and energy sectors.

In chapter 14, the book concerns itself with opportunities and challenges of AI in Africa's agricultural sector. Africa's young vibrant population alongside the movement of people, goods and services around Africa, promoted under the African Union's (AU) Agenda 2063 provide a robust platform for AI driven agricultural transformation. This is pivotal because of the multi-layered agricultural paradoxes on the continent. For instance, Africa is endowed with an abundance of uncultivated arable land and diverse agro-ecological zones, from rain-forest vegetation to dry and arid vegetation, which engender the growth of wide-ranging food and cash crops, yet it suffers an alarming increase in food insecurity. The chapter argues that the application of agriculture-related AI in Africa should be anchored on tailoring the technologies to African realities. In this regard, the chapter selectively unpacks the agricultural landscape alongside nascent AI developments, examines some of the crucial threats to agricultural production, and discusses the role of AI in tackling the threats to agricultural production in Africa. The chapter then maps out the AU's agriculture and AI-related laws and policies respectively and examines the future of agriculture given the technological revolution brought about by the development of AI in Africa.

Focusing on the regulation of AI in the environmental assessment in Africa, chapter 15 commences with a description of environmental and social impact assessment (ESIA) processes, including the role and challenges of AI in the field. The chapter highlights and discusses the threats which the application of AI tools pose to ESIA processes, especially as it relates to environmental protection and the protection of the rights of indigenous peoples and local communities over their natural resources and traditional knowledge. Essentially, the chapter argues that law can play an important *ex-ante* role in preventing the replication of biases embedded into AI tools deployed, mainly in Francophone African countries, and an *ex-post* role, in assigning responsibility where damages result from the use of AI in the ESIA processes.

As the concluding part, chapter 16 draws on the contributions of the chapters before it to identify and discuss key areas that would require legal and policy intervention in the form. This could be through an appropriate regulation regime that will enable Africa to control the disruptive effects of AI and seize the opportunities it offers for the growth and development of the continent.

1.5 References

Abbott R *The Reasonable Robot: Artificial Intelligence and the Law* (Cambridge: CUP, 2020).

Abbott R *Research Handbook on Intellectual Property and Artificial Intelligence* (Cheltenham: Edward Elgar, 2022).

Abe O and Akinyi JE 'Regulating artificial intelligence through a human rights-based approach in Africa' (2022) 14(4) *African Journal of Legal Studies* 425–448.

Access Partnership: 'Artificial Intelligence for Africa: An Opportunity for Growth, Development and Democratisation' (2018) 4 <https://www.up.ac.za/media/shared/7/ZP_Files/ai-for-africa.zp165664.pdf> (accessed 3 February 2023).

ACHPR: 'Resolution on the need to undertake a Study on human and peoples' rights and artificial intelligence (AI), robotics and other new and emerging technologies in Africa' – ACHPR/Res. 473 (EXT.OS/ XXXI) of 25 February 2021 <https://www.achpr.org/sessions/resolutions?id=504> (accessed 3 February 2023).

Adams R 'AI in Africa: Key Concerns and Policy Considerations for the Future of the Continent' (2022) <https://afripoli.org/ai-in-africa-key-concerns-and-policy-considerations-for-the-future-of-the-continent> (accessed 20 June 2023).

Adams R *Human Rights and the Fourth Industrial Revolution in South Africa* (Cape Town: HSRC Press, 2021).

Agreement Establishing the African Continental Free Trade Area, 2018 <https://au.int/en/treaties/agreement-establishing-african-continental-free-trade-area> (accessed 3 February 2023).

AI Index Report 2023.

AI Institute of South Africa: <https://aii-sa.co.za/home-2/> (accessed 3 February 2023).

AI4D: 'Artificial Intelligence in Sub-Saharan Africa: A Compendium Report' (2021) <https://ircai.org/wp-content/uploads/2021/03/AI4D_Report_AI_in_SSA.pdf> (accessed 16 August 2023).

Allianz 'The Rise of Artificial Intelligence: Future Outlook and Emerging Risks' (2017) <https://www.agcs.allianz.com/content/dam/onemarketing/agcs/agcs/reports/AGCS-Artificial-Intelligence-Outlook-and-Risks.pdf> (accessed 3 February 2023).

AU: 'The Digital Transformation Strategy for Africa (2020–2030)' <https://au.int/sites/default/files/documents/38507-doc-dts-english.pdf> (accessed 3 February 2023).

AUDA-NEPAD: 'The African Union Artificial Intelligence Continental Strategy for Africa' (23 May 2022) <https://www.nepad.org/news/african-union-artificial-intelligence-continental-strategy-africa> (accessed 18 February 2023).

AUDA-NEPAD: 'AI for Africa: Artificial Intelligence for Africa's Socio-economic Development' (August 2021) <https://www.nepad.org/publication/ai-africa-artificial-intelligence-africas-socio-economic-development> (accessed 4 April 2023).

Australian Government: 'Australia's AI Action Plan' (2021) <https://www.industry.gov.au/publications/australias-artificial-intelligence-action-plan> (accessed 3 February 2023).

Barfield W and Pagallo U (eds) *Research Handbook on the Law of Artificial Intelligence* (Cheltenham: Edward Elgar, 2018).

Bawack RE, Wamba S and Carillo KD 'A framework for understanding artificial intelligence research: insights from practice' (2021) 34(2) *Journal of Enterprise Information Management* 645–678.

Bawack RE, Wamba SF, Carillo KDA and Akter S 'Artificial Intelligence in E-commerce: A Biometric Study and Literature Review' (2022) 32 *Electronic Markets* 297–338.

Bennun ME (ed.) *Computers, Artificial Intelligence and the Law* (New York: Ellis Horwood Ltd, 1991).

Bennun M and Narayanan A (eds) *Law, Computer Science and Artificial Intelligence* (Bristol: Intellect Ltd, 1998).

Berk R *Machine Learning Risk Assessments in Criminal Justice Settings* (Berlin: Springer, 2019).

Bowen GA 'Document analysis as a qualitative research method' (2009) 9(2) *Qualitative Research Journal* 27–40.

Calo R, Froomkin AM and Kerr I (eds) *Robot Law* (Cheltenham: Edward Elgar, 2016).

Castets-Renard C and Eynard J (eds) *Artificial Intelligence Law: Between Sectoral Rules and Comprehensive Regime Comparative Law* (Brussels: Larcier-Intersentia, 2023).

Chesterman S *We, The Robots? Regulating Artificial Intelligence and the Limits of the Law* (Cambridge: CUP, 2021).

CIPIT: 'State of Artificial Intelligence in Africa 2023 Report' (2023) <https://cipit.strathmore.edu/state-of-artificial-intelligence-in-africa-2023-report/> (accessed 20 June 2023).

Corrales M, Fenwick M and Forgó N *Robotics, AI and the Future of Law* (Berlin: Springer, 2018).

Corrigan CC, Asakipaam SA, Kponyo JJ and Luetdge C (eds) *AI Ethics in Higher Education: Insights from Africa and Beyond* (Berlin: Springer, 2023).

Council of Europe: 'Consolidated Working Draft Framework Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law' CAI(2023)18

<https://rm.coe.int/cai-2023-18-consolidated-working-draft-framework-convention/1680abde66> (accessed 18 July 2023).

Council of Europe: 'Revised Zero Draft [Framework] Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law' CAI(2023)01 <https://rm.coe.int/cai-2023-01-revised-zero-draft-framework-convention-public/1680aa193f> (accessed 16 February 2023).

D'Agostino G, Goan A and Piovesan C (eds) *Leading Legal Disruption: Artificial Intelligence and a Toolkit for Lawyers and the Law* (Montreal: Éditions Yvon Blais, 2021).

Dosunmu D 'Inside Africa's first humanoid' (2022) <https://techcabal.com/2022/11/04/inside-omeife-africas-first-humanoid/> (accessed 3 February 2023).

ECA: 'UN forum unveils the wonders of artificial intelligence and other STIs for Africa' (2021) <https://www.uneca.org/stories/un-forum-unveils-the-wonders-of-artificial-intelligence-and-other-stis-for-africa> (accessed 3 February 2023).

Eke DO, Wakunuma K and Akintoye S (eds) *Responsible AI in Africa: Challenges and Opportunities* (London: Palgrave Macmillan, 2023).

European Commission: 'Consultation: White Paper on Artificial Intelligence – A European approach to excellence and trust' <https://digital-strategy.ec.europa.eu/en/consultations/white-paper-artificial-intelligence-european-approach-excellence-and-trust> (accessed 3 February 2023).

European Commission: 'Proposal for a Regulation of the European Parliament and the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts' 2021/0106 (COD) (21 April 2021) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52021PC0206> (accessed 3 February 2023).

European Commission: 'White Paper on Artificial Intelligence – A European approach to excellence and trust' (2020) <https://commission.europa.eu/system/files/2020-02/commission-white-paper-artificial-intelligence-feb2020_en.pdf> (accessed 3 February 2023).

Findley M, Ford J, Seah J and Thampapilai D *Regulatory Insights on Artificial Intelligence: Research for Policy* (Cheltenham: Edward Edgar, 2022).

Finlay A (ed.) *Artificial Intelligence, Human Rights, Social Justice and Development* (Melville: APC, 2019) <https://giswatch.org/sites/default/files/gisw2019_artificial_intelligence.pdf> (accessed 3 February 2023).

Gerards JH, Kulk S, Berlee A et al. *Getting the Future Right: Artificial Intelligence and Fundamental Right* (Luxembourg: EU Fundamental Rights Agency, 2020) <https://op.europa.eu/en/publication-detail/-/publication/81ff56b2-3dbd-11eb-b27b-01aa75ed71a1/language-en> (accessed 3 February 2023).

Gervais D 'Exploring the Interfaces Between Big Data and Intellectual Property Law' (2019) 10 *JIPITEC* 3–19.

GOV.UK: 'Consultation Outcome – Artificial Intelligence and Intellectual Property: Call for Views' (2020) <https://www.gov.uk/government/consultations/artificial-intelligence-and-intellectual-property-call-for-views> (accessed 3 February 2023).

Government of Canada: 'Responsible Use of Artificial Intelligence (AI)' <https://www.canada.ca/en/government/system/digital-government/digital-government-innovations/responsible-use-ai.html> (accessed 3 February 2023).

Gwagwa A, Kraemer-Mbula E, Rizk N, Rutenberg I and de Beer J 'Artificial Intelligence (AI) Deployments in Africa: Benefits, Challenges and Policy Dimensions' (2020) 26 *African Journal of Information and Communication* <http://www.scielo.org.za/pdf/ajic/v26/02.pdf> (accessed 16 August 2023).

Hall RP and Kibler DF 'Differing methodological perspectives in artificial intelligence research' (1985) 6(3) *AI Magazine* 166–178.

Hashiguchi M 'The Global Artificial Intelligence Revolution Challenges Patent Eligibility Laws' (2017) 13(1) *Journal of Business & Technology Law* 1–35.

K4A: 'Global South map of emerging areas in Artificial Intelligence' <https://k4all.org/project/aiecosystem/> (accessed 3 February 2023).

Kolodin D, Telychko O, Rekun V et al. 'Artificial Intelligence in E-commerce: Legal Aspects' (2020) <https://www.atlantis-press.com/proceedings/isc-sai-20/125937200> (accessed 3 February 2023).

Kurki VAJ and Pietrzykowski T *Legal Personhood: Animals, Artificial Intelligence and the Unborn* (Berlin: Springer, 2017).

Malapane TA and NK Ndlovu 'The Adoption of Artificial Intelligence in South African E-commerce Space: A Systematic Review' (2022) *Systems and Information Engineering Design Symposium* 7–12.

Mantelero A *Beyond Data: Human Rights, Ethical and Social Impact Assessment in AI* (Berlin: Springer, 2022).

Martin-Bariteau F and Scassa T (eds) *Artificial Intelligence and the Law in Canada* (Canada: LexisNexis, 2021).

Mazibuko-Makena Z and Kraemer-Mbula E (eds) *Leap 4.0: African Perspectives on the Fourth Industrial Revolution* (Johannesburg: MISTRA, 2020).

McKinsey & Company 'What is generative AI' (2023) <https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-generative-ai> (accessed 20 June 2023).

Miller H and Stirling R *Government Artificial Intelligence Readiness Index 2019* (Oxford: Oxford Insight, 2019) <https://africa.ai4d.ai/wp-content/uploads/2019/05/ai-gov-readiness-report_v08.pdf> (accessed 3 February 2023).

Moreno A and Redondo T 'Text analytics: the convergence of big data and artificial intelligence' (2016) 3(6) *International Journal of Interactive Multimedia and Artificial Intelligence* 57–64.

NCAIR: <https://nitda.gov.ng/ncair/> (accessed 3 February 2023).

NEDAP: 'Tweet of 18 February 2023' <https://twitter.com/nepad_agency/status/1626836646778863616?s =48&t=lTg0LNPsgw-4UsF15Zijwg> (accessed 18 February 2023).

Nigeria Federal Ministry of Communications and Digital Economy: 'National Digital Economy Policy and Strategy (2020–2030): For a Digital Nigeria' (2020) <https://www.ncc.gov.ng/docman-main/industry-statistics/policies-reports/883-national-digital-economy-policy-and-strategy/file> (accessed 3 February 2023).

Ojo OO 'The emergence of artificial intelligence in Africa and its impact on the enjoyment of human rights' (2021) 14(3) *African Journal of Legal Studies* 326–350.

Oriakhogba DO 'What if DABUS came to Africa? Visiting AI Inventorship and Ownership of Patent from the Nigerian Perspective' (2021) 42(2) *Business Law Review* 89–99.

Paterson JM 'Misleading AI: regulatory strategies for transparency in information intermediary tools for consumer decision-making' (2023) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4422456> (accessed 20 June 2023).

Pavaloaia V and Necula S 'Artificial Intelligence as a Disruptive Technology – A Systematic Literature Review' (2023) 12(5) *Electronics* 1102.

Petheram A and Rahim S *Government AI Readiness Index 2021* (Oxford: Oxford Insight, 2022) <https://static1.squarespace.com/static/58b2e92c1e5b6c828058484e/t/61ead0752e7529590e98d35f/1642778757117/Government_AI_Readiness_21.pdf> (accessed 3 February 2023).

PWC: 'Sizing the prize: What's the real value of AI for your business and how can you capitalise?' <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf> (accessed 3 February 2023).

Quintavalla A and Temperman J (eds) *Artificial Intelligence and Human Rights* (Oxford: OUP, 2023).

Raji R 'Africa wakes up to the potential of artificial intelligence: How Singapore can stake a claim and take advantage of untapped opportunities' (2022) <https://www.ntu.edu.sg/cas/news-events/news/details/africa-wakes-up-to-the-potential-of-artificial-intelligence> (accessed 3 February 2023).

Richie GD and Hanna FK 'AM: A case study on AI methodologies' (1984) 23 *Artificial Intelligence* 249–268.

Rosca C, Covrig B, Goanta C et al. 'Return of the AI: An Analysis of Legal Research on Artificial Intelligence Using Topic Modelling' (2020) <https://ceur-ws.org/Vol-2645/paper1.pdf> (accessed 3 February 2023).

Sarker IH 'AI-Based Modelling: Techniques, Applications and Research Issues Towards Automation, Intelligent and Smart Systems' (2022) 3 *SN Computer Science* 158–177.

Sedola S, Pescino AJ and Greene T *Artificial Intelligence for Africa* (Smart Africa, 2021) <https://smart.africa/board/login/uploads/70029-eng_ai-for-africa-blueprint.pdf> (accessed 20 June 2023).

Serey J, Quezada L, Alfaro M et al. 'Artificial intelligence methodologies for data management' (2021) 13 *Symmetry* 2040.

Shearer E, Stirling R and Pasquarelli W *Government Artificial Intelligence Readiness Index 2020* (Oxford: Oxford Insights, 2020) 83 <https://static1.squarespace.com/static/58b2e92c1e5b6c828058484e/t/5f7747f29ca3c20ecb598f7c/1601653137399/AI+Readiness+Report.pdf> (accessed 3 February 2023).

Song X, Yang S, Huang Z and Huang T 'The Implication of Artificial Intelligence in Electronic Commerce' (2019) *Journal of Physics: Conferences Series* <https://iopscience.iop.org/article/10.1088/1742-6596/1302/3/032030/meta> (accessed 3 February 2023).

South African Government: 'Report of the Presidential Commission on the Fourth Industrial Revolution' (2020) <https://www.gov.za/sites/default/files/gcis_document/202010/43834gen591.pdf> (accessed 3 February 2023).

Stanford University HAI: 'Artificial Intelligence Index Report 2023' (2023) <https://aiindex.stanford.edu/wp-content/uploads/2023/04/HAI_AI-Index_Report_2023.pdf> (2023 Stanford AI Index Report) (accessed 4 April 2023).

Stone P 'Artificial Intelligence and Life in 2030: One Hundred Year Study on Artificial Intelligence' (2016) <https://ai100.stanford.edu/sites/g/files/sbiybj18871/files/media/file/ai100report10032016fnl_singles.pdf> (accessed 3 February 2023).

Turner J *Robot Rules: Regulating Artificial Intelligence* (London: Palgrave Macmillan, 2019).

UK Department for Science, Innovation & Technology: 'A Pro-Innovation Approach to AI Regulation' (March 2023) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1146542/a_pro-innovation_approach_to_AI_regulation.pdf> (accessed 4 April 2023).

UNCTAD: 'The value and role of data in electronic commerce and the digital economy and its implications for inclusive trade and development' (2019) <https://unctad.org/system/files/official-document/tdb_ede3d2_en.pdf> (accessed 3 February 2023).

UNESCO: 'Artificial Intelligence Needs Assessment Survey in Africa' (2021) <https://unesdoc.unesco.org/ark:/48223/pf0000375322> (accessed 3 February 2023).

UNESCO: 'Landscape study of AI Policies and use in Southern Africa: Research Report' (2022) <https://unesdoc.unesco.org/ark:/48223/pf0000385563?posInSet=4&queryId=N-EXPLORE-c857f790-62e2-4d7a-972f-ddc16d040edc> (accessed 20 June 2023).

UNESCO: 'Recommendation on the Ethics of Artificial Intelligence' (2022) <https://unesdoc.unesco.org/ark:/48223/pf0000381137> (UNESCO Recommendation) (accessed 3 February 2023).

USPTO: 'Public Views on Artificial Intelligence and Intellectual Property Policy' (2020) <https://www.uspto.gov/sites/default/files/documents/USPTO_AI-Report_2020-10-07.pdf> (accessed 3 February 2023).

Van Cuilenburg JJ, Kleinnijenhuis J and de Ridder JA 'Artificial intelligence and content analysis: problems of and strategies for computer text analysis' (1988) 22 *Quality and Quantity* 68–97.

Villani C, Bonnet Y, Schoenauer M et al. *For a Meaningful Artificial Intelligence: Towards a French and European Strategy* (Paris: Conseil national du numérique, 2018).

WIPO: 'Artificial Intelligence and Intellectual Property Policy' <https://www.wipo.int/about-ip/en/artificial_intelligence/policy.html> (accessed 3 February 2023).

WIPO: 'Revised Issues Paper on Artificial Intelligence and Intellectual Property Policy' (2020) <https://www.wipo.int/edocs/mdocs/mdocs/en/wipo_ip_ai_2_ge_20/wipo_ip_ai_2_ge_20_1_rev.pdf> (accessed 3 February 2023).

WIPO: 'Technology Trends: Artificial Intelligence' (Geneva, 2019) <https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf> (accessed 3 February 2023).

Wischmeyer T and Rademacher T (eds) *Regulating Artificial Intelligence* (Berlin: Springer, 2020).

Wright JD (ed.) *International Encyclopaedia of Social and Behavioral Sciences: Reference Work* (Amsterdam: Elsevier, 2015).

WTO: 'Digital connectivity, e-commerce and sustainable trade' (2022) *Aid for Trade Global Review* <https://www.wto.org/english/res_e/booksp_e/aid4trade22_chap3_e.pdf> (accessed 3 February 2023).

Yu D, Rosenfeld H and Gupta A 'The "AI divide" between the Global North and the Global South' (2023) <https://www.weforum.org/agenda/2023/01/davos23-ai-divide-global-north-global-south/> (accessed 3 February 2023).

Chapter 2

A technoscience approach to law as technology and the gendering of artificial intelligence policy in South Africa

2.1 Introduction

This chapter examines the work that policy does in the emerging realm of artificial intelligence (AI) governance in South Africa with particular attention to questions of gender. On-going debates around the Fourth Industrial Revolution (4IR) have generated the need for a regulatory and policy framework to govern AI technologies and machine-learning. Given that AI technologies influence multiple sectors of South Africa, the applicable legal apparatus for this purpose is not singular but rather distributed across multiple areas of law. In offering a strategic focus for South Africa to compete in the 4IR, the 2020 South African Report of the Presidential Commission on the 4th Industrial Revolution (PC4IR report) provides a set of priorities and concerns that play a role in shaping debates across various areas of the law for how to govern AI technologies.[1] Through a critical analysis of the PC4IR report, this chapter examines the vision that South Africa has for the governing of AI and suggests how it can be strengthened to attend to gender.

The first part of the chapter briefly discusses how the PC4IR report informs and is informed by narratives of 'techno-legal-optimism' that simultaneously portray the promise of AI-based technologies and AI policy, while shielding them both from critical scrutiny and thus reinforcing the status quo and its hierarchies of race and gender. The second part frames the PC4IR report within understanding law as technology, suggesting that a technoscience approach is needed to understand how AI policy is deployed as a technology that applies and is often shaped by normative understandings of race and gender. The third part models a technoscience approach to critically analysing AI policy by conducting a textual analysis of the PC4IR report that takes colonial and apartheid histories into account, while arguing for greater attention to gender as intersectional and multiple, gendered histories of knowledge production, and interconnections of gender and more-than-humans.

In doing so, it develops a technoscience approach to law as technology to examine how the law is deployed not just to govern society, but is also actively shaped by society and its normative values. This approach enables an understanding of how the PC4IR report articulates limited conceptions of gender informed by Western understandings of binary gender, while simultaneously offering suggestions for how the PC4IR report could address gender in more multiple and relational ways to strengthen its vision of the 4IR for South Africa towards a more meaningful future that ensures

1 Report of the Presidential Commission on the 4th Industrial Revolution (PC4IR report).

dignity for all as enshrined in the Constitution of South Africa.[2] This chapter also argues that what is needed is not just more regulation of AI, but a fundamental rethinking through a technoscience approach of the very assumptions that undergird efforts toward the governing of AI-based technologies. More equitable gendered relations and the wellbeing of those who self-identify beyond the gender binary depends on so much more than economic prosperity, and is deeply connected to wellbeing for others, including nonhuman beings.

2.2 Narratives of techno-legal-optimism

A technoscience approach to law, as is elaborated on in the next section, enables an understanding of how the PC4IR report is informed by and contributes to narratives of what I refer to as 'techno-legal-optimism'. At the same time, it goes towards conceptualising the PC4IR report (and AI policy more broadly) not as a neutral tool, but rather a situated technology for governing AI-based technologies that is shaped by rather than demarcated from dominant values and narratives of society. Narratives of techno-legal-optimism can be understood as accounts that portray the promise of both technologies and the law to ensure simultaneously advanced technological and legal futures with a hope, confidence, and positivity that hinders an understanding of their limits and potential harms. As an example of such narratives and as modes of cultural production, news media accounts distributed across the continent of Africa craft and contribute to public understandings and perceptions of the promise of both AI technology and the law.[3] They portray AI technologies through an ideology of techno-utopianism that assumes technology will advance human progress and betterment. Recent media headlines pronounce how AI technologies have the potential to end hunger in Africa,[4] combat malaria,[5] rescue endangered rhinos,[6] and drive economic growth into the 4IR.[7] These narratives reflect a hopefulness and optimism that AI technologies can solve deep social problems.

At the same time, narratives of techno-optimism touting the potential of AI technologies have risen alongside the promise of the law to regulate and govern these technological futures. News media directed to audiences across the African continent proclaim that 'strong policy action is needed' to 'run with the machines'[8] and that government has a 'special responsibility' to carefully assess the risks of AI technology[9] as policies are needed for 'guiding and facilitating the use of AI'[10] and that regulators will need to

2 Constitution of the Republic of South Africa 1996.
3 News media accounts work alongside other social actors such as academics, researchers, technology experts, politicians, and executives within various industries (e.g. finance, manufacturing, and health care) who perpetuate similar narratives of techno-optimism, but in the interest of space, the focus here will remain on news media.
4 Ruvaga L 'Could Big Data Help End Hunger in Africa?'
5 IBM South Africa 'AI in the Fight Against Malaria'.
6 Gilbert P 'MS Azure comes to rescue of on-the-brink rhinos'.
7 Adinde I 'Nigeria must invest in ICT education for youth empowermen'.
8 Lagarde C 'Looking ahead to chart today's course: The future of work in sub-Saharan Africa'.
9 Hamann R 'Developing countries need to wake up to the risks of new technologies'.
10 Kanyua J 'Connecting Kenya: AI as a government tool to accelerate manufacturing sector growth'.

'up their game' to address AI innovations[11] and promote ways of 'engineer[ing] AI in a safer way'.[12] There is an optimism in the role of government and law to govern AI technologies. The PC4IR report contributes to this optimism by offering a set of priorities for the future of South Africa in the 4IR.

As society and policy are always and already co-constituted, these narratives are similarly constructed and reinforced within emerging South African AI policy. In developing a strategic vision for the 4IR for development, the PC4IR report shares that the proposed dream for the country in the 4IR is: 'South Africa will have a globally competitive, inclusive and shared economy with the technological capability and production capacity that is driven by people harnessing the 4IR to propel the country forward towards its social and economic goals, instead of falling behind.'[13] Its vision attests and imbues AI technologies with the potential and promise to increase the 'economic competitiveness' of the nation-state and the 'social wellbeing' of its people.[14] This dream imagines AI technologies within a techno-utopia, thrusting South Africa and its people into competitive development futures.

At the same time, it imagines a future where the South African nation-state government is 'the institutional custodian of the 4IR strategy'[15] and 'director of techno-industrial outcomes'[16] with a responsibility to orchestrate policies that 'will be the backbone for economic growth' in the 4IR.[17] The South African government needs 'to be cognisant of the [4IR] and how this revolution, through policy creation and a clear coordinated strategy, can aid inclusive economic growth in South Africa.'[18] The PC4IR report thus holds out law and regulation as key elements for ensuring that the progress and promise of the 4IR and its technological advances is met for the (economic) future of South Africa.[19]

These narratives enable South African officials to position the country in strategic ways to take advantage of increased levels of funding and resources related to AI and its governing. International organisations such as the United Nations and global north countries, including the United States and organisations in the United Kingdom and

11 Nwannekanma B 'Nigerians need knowledge to benefit from innovations in financial services'.
12 Snell R 'Ethical considerations for artificial intelligence'.
13 *GG* 43834 at 140.
14 Ibid. at 137.
15 Ibid. at 220.
16 Ibid. at 160.
17 Ibid. at 20.
18 Ibid. at 220.
19 The PC4IR report urges the need for 'smart laws' to ensure 'technological advancement' (at 49), data protection laws and labour law to regulate the gig economy (at 84), open data laws (at 103), intellectual property laws to ensure commercialization (at 112). It contends that law and regulation that must not 'slow down the uptake of 4IR' (at 113). It calls for policies to ensure equal participation in the 4IR, address risks of inequality such as data ownership and IP (at 27) and remove obstacles to innovation (at 98). It also notes that '[s]ome examples (not covering the full scope of the 4IR) include policy and legislation related to data access, data privacy, education, skills development, research and development, industrial policy, trade, business development, AI, cyber-security, biotechnology, and autonomous vehicles, amongst many others. The work stream will engage with specialist researchers to develop a detailed mapping' (at 112).

European Union, have directed significant funds towards advancing AI-based innovation, which establishes funding priorities globally. At the same time, it presents opportunities for countries in the global south such as South Africa that then become compelled to adopt similar narratives of techno-legal-optimism to utilise and secure these new channels of funding.

The trouble, though, is that these progress narratives of techno-legal-optimism reinforce the authority of both technology and law, and they obscure more critical understandings of these development futures in terms of gender and race. Narratives of techno-optimism, as Ruha Benjamin warns, act as a 'shiny veneer' and 'feel-good grammar' that hides complexity and makes it difficult to recognise the destructive processes of technology, and much less intervene in how they reinforce the status quo.[20] In the context of South Africa, in particular, they impede critical understandings of how AI-related technologies may exacerbate or address racialised gender inequalities, or how to incorporate an intersectional gendered analysis into AI policy. They hinder a gendered analysis too of how practices of 'data colonialism' may differ in scale, intensity, and context from colonialism but continue to capture and control human life itself through the appropriation and extraction of data from it for profit.[21] According to Sonja van Wichelen they also dismiss how law itself is a technology that has played a central role in shaping society and history with its normative assumptions of universalism and individualism.[22] To critically examine the work that the PC4IR report does in crafting a vision for South Africa and how it can be strengthened, it becomes important to examine what it means to understand the report itself as a technology.

2.3 A technoscience approach to understanding AI policy as technology

A technoscience approach to law enables an understanding of how South Africa is promising AI policy itself as a technology, bolstered by narratives of techno-legal-optimism, that can govern AI-based innovations with certainty and predictability to ensure justice. By technoscience, this chapter is referring to a theoretical approach informed by the field of science and technology studies that analyses how science is not separate from but shaped simultaneously by technological applications (hence the joining of the terms 'techno' and 'science') and associated desires to make science work for capitalist means of production and profit in unequal ways. Conceptualising law as shaping and being shaped by society and thus not value-neutral, a technoscience approach to the law enables understandings into how dominant institutional forces deploy law as a technology (actually and metaphorically) to reinforce the status quo. Conceptualising law as a technology provides a framework for understanding the work that the PC4IR report does in promoting a vision of South Africa in the 4IR, and how it remains limited for addressing questions of intersectional gender. The PC4IR report is more than a legal document or set of guidelines. The Presidential Commission sets it forth as a technology to produce an aspirational set of priorities, values, and

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20 Benjamin R *Race After Technology Abolitionist tools for the New Jim Code*.

21 Couldry N and Mejias UA *The Costs of Connection: How Data is Colonizing Human Life and Appropriating it for Capitalism*.

22 Van Wichelen S 'Law as Antikinship: The Colonial Present in Global Surrogacy' at 1–21.

assumptions for the future of South Africa and its people in the 4IR, which changes how we think about both AI-based technology and AI law and policy. As a technoscience approach to law modelled here will make apparent though it is not a value-neutral legal device, but one deeply informed by society and its colonial legacies of race and gender.

A technoscience approach to the law becomes more apparent though with a discussion in this section that first distinguishes approaches to law *and* technology from those of law as technology. It then demonstrates how theories of law and critical legal scholarship (for example Socratic method, legal formalism, legal realism, new legal realism) have conceptualised law as a tool in different ways that, as I contend, offer valuable insights for scholars of science and technology studies who are alternatively theorising law as technology.

Notions of law *as* technology are not the same as how lawyers and legal scholars tend to focus on questions of law *and* technology. A prevailing South African textbook, *Information and Communications Technology Law*, for instance, acquaints students with a study of 'informatics law' that focuses on legal problems arising from information and communications technologies (ICTs) such as the following: patenting of hardware and software, data security and privacy, e-commerce (contracts, electronic payments, consumer protections), trademarks and domain names, copyright infringement and protection of electronic databases, freedom of expression (defamation, hate speech, harassment), and the protection of digital property.[23] Van der Merwe D et al. also note the study of legal informatics such as the emergence of legal technologies that aid in the storage, retrieval, and processing of legal information to assist in legal decision-making. Informatics law must contend with questions of gender and technology, for example, that consider gender disparities in the AI-based workforce and access to ICTs.

In contrast, the technoscience approach to the study of law developed here is informed by different interpretations and shifts in what is meant by law as technology. In the late nineteenth century, Christopher Langdell, faculty at Harvard Law School, sought to frame law as a science by introducing the case study method into United States law schools,[24] which eventually became the dominant approach to legal education globally, including in South Africa. Informing and informed by theories of 'legal formalism' that understood the law as detached from society, the pedagogical technique endeavoured to teach students how to observe and analyse prior cases to discover the truth behind formal rules of legal precedence and then mechanically apply them to new fact patterns to generate just and equitable decisions without regard to social interests or public policy. Proponents of legal formalism, by analogising legal reasoning to scientific method, offered a sense of predictability and certainty to legal decision-making, while simultaneously engendering a metaphorical vision of the law as a science.[25]

However, a new vision of law understood as 'legal realism', that embraced both a metaphorical and literal understanding of the law as a tool for shaping society while offering a more flexible approach to legal reasoning as a science began to emerge. In her discussion of debates over Conflicts of Law doctrine, Annelise Riles examines how theories of legal realism beginning in the 1930s generated a 'new' scientific vision of

23 Van der Merwe D et al. *Information and Communications Technology Law*.
24 Riles A 'A new agenda for the cultural study of law: Taking on the technicalities' at 1001.
25 Ibid. at 998.

the law by deploying metaphors of the law as a tool. In response to formalist portrayals of law as a machine disconnected from society, proponents of legal realism produced conceptions of the law as a 'technical machine' for social and economic engineering.[26] This conception of the law as a means to an end embraced a rationalist and scientific legal reasoning that would take social interests and public policy into account. The lawyer and the legal scholar were likened to an engineer or mechanic whose job was to focus less on discovering the certainty of legal doctrine and more on thinking through the technicalities of the law, applying legal reasoning through a more flexible and experimental process of re-evaluating and modifying legal rules as new fact patterns emerged and social conditions changed.[27] The metaphorical idea that the law was like a tool and like a machine, Annelise Riles argues, shifted in the mid-twentieth century to include a quite literal understanding of the law as a tool of social policy and state power.[28]

More recently, critical legal scholars invested in empirical studies of law and society have developed a 'new legal realism' that offers a different understanding of the law as a tool.[29] While legal realist conceptions understood law as a tool directed at shaping social interests, they remained attached to a scientific vision of the law that failed to consider how society in turn shapes the law. They assumed the law to be a value-neutral tool. In contrast, proponents of new legal realism understand the law as a tool that can promote certainty, predictability, guidance, reasoning, institutional responsibility, and dispute resolution, but that is also shaped by social context and thus not value-neutral.[30] The law can be a tool for regulating society, but it is not a one-way direction, it is also governed by society and social norms that inform and constrain its directions.

Through a different trajectory, critical legal scholars drawing upon science and technology studies have developed understandings of law as a technology, meaning a system or coordinated collection of legal tools that shape and are shaped by society. To frame law as technology grapples with how the law is deployed as a tool, but brings a different focus on how the law is an application of and is constructed by and through technological, social, political, historical, and economic forces; in other words, a technoscience approach to law as technology focuses on co-constituted interactions of law, technology, and society.[31] In this respect it shares a similar emphasis to new legal realism on the interrelatedness of law and society, but shifts the focus to law as technology rather than the law as a tool. Thinking about law as technology, as Biagioli and Buning contend, brings into question what is meant by technology and the law.[32] The old approach of patents, for example, as tools that the law applied to protect different

26 Ibid. at 1002.

27 Ibid.

28 Ibid. at 981.

29 Macaulay S 'The new versus the old legal realism: "Things ain't what they used to be"' at 392.

30 Shaffer G 'The new legal realist approach to international law' at 189–210.

31 Jasanoff S (ed.) *States of Knowledge: The Co-production of Science and Social Order*; Jasanoff S *Science at the Bar: Law, Science, and Technology in America*; Van Wichelen 'Law as Antikinship: The Colonial Present in Global Surrogacy' at 1–21; Biagioli M and Buning M 'Technologies of the law/law as a technlogy' at 3–17; Eaglin J 'When critical race theory enters the law & technology frame' at 151–168.

32 Biagioli and Buning at 3.

technologies has given way to one in which 'the interaction between law and technology develops both new articulations of patenting as well as new definitions of technology'.[33]

Extending their analysis here, I suggest that framing such analysis as a technoscience approach to law as technology offers more explanatory power as it makes its connections to the theoretical insights of the field of science and technology studies more apparent, and its foundational assumption of law as technology clearer. Taking this further, a technoscience approach imparts a focus thus on what I refer to as 'techno-legalities', meaning the manner in which law and technology are co-constituted in relation to each other and thus always and already informed by socio-historical pasts and their residues, which is modelled after the language of 'technoscience' to emphasise how technology and science are continually constructing and reinforcing one another, and recent analyses of 'biolegalities' that explore the interactions of law with new biotechnologies and biological knowledge.[34]

A technoscience approach can provide new insights into how dominant forces have deployed law as a technology to order the world through division and differentiation,[35] and for colonialism and apartheid.[36] Colonial settlers deployed the legal doctrine of *terra nullius*, for example, as a tool to extract South African lands and resources, and the National Party implemented the 1950 Population Registration Act (among other legislation) and its racial classification scheme to ensure white supremacy. Thinking about the use of these legal doctrines and legislation more as a technology demonstrates the interconnections of law and scientific classification, while bringing into question dominant conceptions of both law and science as objective and value neutral.

At the same time, it provides understanding into how individuals and groups have deployed the law to challenge hierarchies and relations of power. In response to legacies and historical residues, the African National Congress, for example, deployed the law as a technology to counter the status quo and to reimagine the nation-state in 1996 when it ratified the South African Constitution. In doing so, it changed how people understood the rule of law and racial classification schemes. It became more apparent that colonial and apartheid-era laws were not natural and divined by God, but were a man-made technology of governing meant to reinforce whites as superior and thus deserving of protected rights to property and capital. It promoted an aspirational vision of the law as a technology that could be redrafted and tinkered with to address past injustices and ensure the dignity of all peoples of South Africa, and an understanding of law not as ahistorical but as deeply informed by society its historical pasts and legacies. While the guarantee of the South African Constitution to ensure dignity and equitable opportunities remains a promise in theory that has not been realised through implementation, the promise itself in the role of government to ensure the positive rights of its people (rather than the negative right not to interfere) is quite radical indeed. A

33 Ibid. at 7.

34 Van Wichelen S 'Changing rights to family life: Biolegalities in the globalization of reproduction' at 26–50.

35 Alvarez-Nakagawa A 'Law as magic: Some thoughts on ghosts, non-humans, and shamans' at 1247–1275.

36 Posel D 'Race as common sense: Racial classification in twentieth-century South Africa' at 87–113.

technoscience approach to law as a technology, therefore, should be quite familiar to scholars of South African law and policy.

Addressing the law less a tool and more as a technology, a technoscience approach is different from a technological perception of the law and, at the same time, it enables an understanding of associated knowledge practices and assumptions that undergird the law. For example, it shows how knowledge practices that promote a technological understanding of the law represent a way of thinking and being that reinforce values of ordering, sorting, classifying, predicting, managing, and regulating the world. As histories and residues of the gendered classification of race are similarly grounded in these logics of classification and bifurcation, a technological understanding of the law as a calculated tool for social policy risks further constructing and reinforcing these hierarchical ways of being and knowing. It becomes important then for law and policy scholars to develop a technoscience approach that can critically attend to the assumptions that inform and are informed by AI policy, what their potential limits are, and what possibilities exist for governing AI-related technology towards more meaningful social justice futures that dismantle hierarchies of classification. The next section begins to develop and model this approach by critically examining the PC4IR report with the goal of strengthening its attention to gender and gender relations.

2.4 Gendering artificial intelligence policy

The PC4IR report acts as a technology that works to create a vision for South Africa in the 4IR. Its main purpose is to establish a set of priorities for advancing South Africa as a leading producer, rather than mere adopter, of digital technologies into the future.[37] It explicitly claims that it is meant to address past injustices from colonialism and apartheid rule. Thus, it deploys the law as a technology that is situated within historical legacies, rather than as a technology detached from them. However, while the PC4IR report attempts to challenge colonial and apartheid pasts it remains limited. For instance, it does not go far enough to meaningfully consider intersectional gender, gendered colonial histories and modes of knowledge production, or interconnections of gender and more-than-humans. Although it aspires to deploy AI policy as a tool towards social wellbeing, the PC4IR report too easily slips into bringing AI policy into service as a value-neutral technology meant to realise the economic prosperity and leadership of the South African nation. It is these tension between moments of the PC4IR report as technology that become important sites of inquiry for gendering AI policy. As the members of the Presidential Commission would likely agree, there is much more work to be done to establish a vision for the 4IR that addresses these complex facets of gender and gendered relations. If the PC4IR report and AI policy are more generally understood through a technoscience approach, it can be recalibrated to consider gender in more complex ways to enable just futures in the 4IR. In this section, the chapter offers some initial ways for rethinking the PC4IR report to attend to gender in more meaningful ways.

37 Adams R 'The gendered impact of artificial intelligence and the fourth industrial revolution in South Africa: Inequality, accessibility and skills development'.

2.4.1 *Attend to gender as intersectional and multiple*

Examining the governing of AI-based technologies through a technoscience approach provides insights into how the PC4IR report and similar policies are informed by normative understandings of gender as binary, but also how they can be recalibrated to enable notions of gender as intersectional and multiple. It provides an understanding into how the PC4IR report as a technology is an application of law and policy thinking for the purposes of governing the 4IR, but also an enactment of hierarchies of knowledge production that have historically constructed meanings of gender in limited ways.

Society narrowly understands gender often in dominant (often read as Western) binary terms as limited to expressions of normative masculinity and femininity, and frequently conflates gender with sex as confined to characteristics of male and female. This results in a dismissal of different expressions of gender identity, of intersex, and the multiplicity of sex across chromosomes, hormones, gonads, genitalia, and internal reproductive organs. Alternatively, feminist scholars have produced valuable insights into how cultural and social understandings of gender inform biological understandings of sex and vice versa[38] and how racialised colonial practices of viewing the body have constructed and reinforced Western hierarchies of understanding sex and gender across Africa.[39] Conceptions of sex/gender are thus intersectional and multiple, and they manifest differently in different African contexts where, as Oyěwùmí argues,[40] gendered social roles in Yoruba society, for example, are based more on social questions of seniority and age, and less on naturalised categories of the body as assigned the male or female sex. A technoscience approach to examining the PC4IR report reveals how its discussion of gender is limited in that it shapes and is shaped by normative societal understandings of binary sex/gender (male/female or masculine/feminine), and often conflates gender as sex rather than intertwined with it.

The PC4IR report, for example, addresses gender but unfortunately relegates its brief discussion mostly to the topic of sex-ratios within a two-page overview section on socio-economic and human development. A key take away stated in the report is that, despite a sex-ratio at birth that tends to favour the birth of boys, there are more females than males in South African society given their higher life expectancies.[41] The assessment of sex-ratios provides some context into the current status quo in South Africa, but without further discussion regarding gender and gendered relations as intersectional and multiple, the PC4IR report establishes and reinforces normative assumptions of binary gender as guiding the governing of digital technologies. It also presents gender at the outset as strictly connected to biology, which naturalises gender as socially fixed and limited to normative roles of masculine and feminine that are understood to flow neatly from sex-assignments at birth as male or female. This detracts from an understanding of gender and gender relations as more fluid and multiple, and how biological sex is itself informed by social understandings of gender.[42] It

38 Butler J *Gender Trouble: Feminism and the Subversion of Identity*; Martin E 'The Egg and the Sperm: How Science has Constructed a Romance based on Stereotypical Male-Female Roles'.

39 Oyěwùmí O 'Visualizing the body: Western theories and African subjects'.

40 Ibid.

41 *GG* 43834 at 235.

42 Richardson SS *Sex Itself: The Search for Male and Female in the Human Genome*.

thus leaves little room to consider an AI future for people who identify as non-binary, transgender, and genderqueer and who defy dichotomous categories of gender.

By conceptualising gender first through a discussion of sex-ratios, the PC4IR report also obscures how gender is shaping and being shaped by race. While women may have a longer life expectancy than males, Black women continue to experience greater health disparities due to histories and experiences of racial discrimination that may lower their life expectancies.[43] Shifting away from the naturalising of gender as binary, the governing of AI-based technologies must arise out of a more explicit articulation of gender as intersectional and multiple.[44] The stakes are much too high in the 4IR not to establish a more nuanced approach to gender for guiding AI policy.

Gender can be a powerful marker of social identity and mode of social movement belonging, but the PC4IR report fails to address how in the 4IR, as Thao Phan demonstrates,[45] capitalist enterprises have further transformed gender into a reductive data point to sell products, target consumers, and personalise advertising. The restyling of gender for algorithmic quantification in the service of capitalism is also a concern arising across the continent of Africa. For instance, AI-based digital assistants deploy a feminised voice that further entrenches racialised and gendered norms of domesticity and servitude informed by colonial histories.[46] The financial industry in South Africa, Kenya, Nigeria and Ghana is beginning to utilise AI-based technologies for banking services, credit scoring, and fraud detection, but it risks amplifying gender bias and inequalities because of its use of poorly designed algorithms and biased data sets.[47] Through a study of images of politicians serving in the parliaments of South Africa, Rwanda and Senegal, Joy Buolamwini and Timnit Gebru also find that facial analysis algorithms perpetuate gender and racial bias by misclassifying the faces of darker skinned females more often than lighter skinned males.[48] The PC4IR report, as a technology, with its narrow attention to gender as sex-ratios and its lack of attention to the algorithmic quantification of gender, means it is limited as a policy device to address gender in the 4IR.

It is also limited by its lack of attention to how the future of work in the 4IR impacts women across the African continent in different ways. AI-based technologies can provide opportunities for challenging hierarchies of racialised gender, especially through the inclusion of women within new domains of work, but AI policy must develop an intersectional analysis to address potential inequities in a meaningful way. For instance, in a study of 160 companies across 21 African countries, the AI workforce is found to comprise a significantly less number of females (29%) than males

43 Chinn J, Martin I and Redmond N 'Health equity among Black Women in the United States' at 212–219.

44 Beyene T and Frost R 'Gender variance and the gender digital divide'.

45 Phan T 'Programming gender: Surveillance, identity, and paranoia' at 46–64.

46 See Adams. See also Phan T 'Amazon echo and the aesthetics of whiteness' at 1–38; Atanasoski N and Vora K *Surrogate Humanity: Race, Robots, and the Politics of Technological Futures*.

47 Ahmed S 'A gender perspective on the use of artificial intelligence in the African fintech ecosystem: Case studies from South Africa, Kenya, Nigeria, and Ghana'.

48 Buolamwini J and Gebru T 'Gender shades: Intersectional accuracy disparities in commercial gender classification' at 1–15.

(71 %).[49] Furthermore, the shift to the 'gig economy' puts in jeopardy some of labour rights that certain women across Africa have gained over the years and, at the same time, the potential automation of agriculture threatens to upend an industry where, as Chiweshe notes,[50] most women across Africa are employed and have no labour protections and rights to begin with. These gender disparities mean that the lived experiences of African women are not considered in the product development cycle, and, this chapter argues, not regarded in AI policy development. Thus, AI technologies are not designed or governed with their needs, desires, and interests in mind. These examples show that the emergence of AI-based technologies is giving rise to new yet familiar modes of inclusion and exclusion along lines of both gender and race, thus demonstrating the need for AI policy to account for gender as intersectional and multiple.

The proliferation of digital technologies has also compounded the problem of racialised gender-based violence in the form of cyber violence. The PC4IR report takes care to briefly mention gender-based violence as impacting socio-economic and human development within the country but leaves cyber violence unaddressed. It notes that the murder rate of women remains significantly higher in South Africa than other countries, and women continue to experience higher rates of rape and sexual violence than men.[51] It also states that gender-based violence contributes to high levels of precarity among women and their children, which impacts their security and wellbeing and that of all members of society.[52] While physical violence against women and girls remains high across South Africa there is also the often-related threat of cyber violence. Internet platforms driven by complicated algorithms that evade scrutiny presents new challenges of gendered cyber violence, which can take the form of online abuse, harassment and stalking that lead to unwanted, offensive and threatening behaviour.[53] This can include cyber stalking, non-consensual pornography, slut-shaming, unsolicited pornography, sextortion, doxing, rape and death threats.[54]

Cyber violence against women and girls is a particular concern across Africa. As the Covid-19 pandemic restricted movement and required social isolation measures, technologically-facilitated gender-based violence exponentially increased and impacted, for example, women and girls in Malawi who responded by blocking their attackers or leaving online platforms altogether.[55] Cyber bullying disproportionately impacts girls,

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49 Ondili M 'Artificial Intelligence: Labour Gender Gap in Africa'. A study of women in the San Francisco tech industry found that black women who identified as LGBTQ and presented as gender fluid did not report the same level of inclusion and acceptance from their male colleagues as their white and Asian women counterparts who identified and presented in similar ways. See also Alfrey L & Twine FW 'Gender-fluid Geek Girls: Negotiating Inequality Regimes in the Tech Industry' at 31. This demonstrates the need for research on how race, sexuality, and gender interact to reproduce structural inequalities in the AI workforce in different ways across Africa.

50 Chiweshe MK 'Fourth Industrial Revolution: What's in it for African Women?'.

51 *GG* 43834 at 236.

52 Ibid.

53 Laxton C 'Virtual world, real fear: Women's aid report into online abuse, harassment and stalking'.

54 European Institute for Gender Equality (EIGE): 'Cyber Violence Against Women and Girls' (2017).

55 Malanga DF 'Tackling gender-based cyber violence against women and girls in Malawi amidst the COVID-19 pandemic'.

but race appears to be a more significant explanatory factor as Black children report the highest incidence of cyber aggression in South Africa.[56] Cyber violence, therefore, violates the rights of women and girls, as enshrined in the African Declaration on Internet Rights and Freedoms to access information online, use the Internet and digital technologies for freedom of assembly and association, maintain their privacy, and protect their personal data.[57] Although South Africa recently expanded the Domestic Violence Amendment Act to better protect against online sexual harassment, and countries such as Ethiopia, Kenya, Senegal and Uganda have put mechanisms in place to address some forms of cyber violence, there needs to be more specific legislation in place to combat technologically-facilitated gender-based violence.[58] A more nuanced attention to gender as intersectional and multiple, as modelled here through this technoscience approach to examining AI policy, is needed to address the way algorithms facilitate gender-based cyber violence, employment discrimination, and race and gender bias.

2.4.2 *Address gendered histories of knowledge production*

To strengthen its efforts for promoting South African innovation in the 4IR, the PC4IR report must address racialised gendered histories of knowledge production. In conceptualising South Africa as an innovator of AI-based technologies, the PC4IR report is deployed as a technology for challenging histories of colonialism, albeit in limited ways. A technoscience approach to AI policy should be attentive to how colonialism and its legacies have constructed and reinforced South Africa as a 'living laboratory' for extracting resources and knowledge, rather than as a place of knowledge production and technological innovation.[59] Colonialism, as Clapperton Chakanetsa Mavhunga contends, enacted and justified the dehumanisation of *vatema* (black peoples) as a tool, pest and non-thinking things.[60] These histories were further bolstered by and justified Western philosophies that theorised reason and rationality as associated with white masculine norms, thus excluding women and people of colour from full personhood as rational subjects.[61] They also included gendered colonial practices of scientific racism that exploited women's bodies as mere objects of study to classify San and Khoi peoples as less than human,[62] which in turn informed apartheid-era racial hierarchies and their lasting legacies.[63]

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56 Burton P and Mutongwizo T 'Inescapable violence: Cyber bullying and electronic violence against young people in South Africa'.

57 African Declaration on Internet Rights and Freedoms.

58 Power T 'New Law Protects Women Against Online Abuse'.

59 Tilley H *Africa as a Living Laboratory: Empire, Development, and the Problem of Scientific Knowledge, 1870–1950*.

60 Mavhunga CC *The Mobile Workshop: The Tsetse Fly and African Knowledge Production*. While my use here of 'black peoples' in lowercase risks reinscribing such histories of dehumanisation, I make the decision here to use the preferred spelling of Mavhunga who writes 'black' in lowercase.

61 Lloyd G 'The man of reason'; Weheliye AG *Habeas Viscus: Racializing Assemblages, Biopolitics, and Black Feminist Theories of the Human*.

62 Abrahams Y 'Gender and locating Sarah Baartman in the present'; Schiebinger LL *Nature's Body: Gender in the Making of Modern*.

63 Dubow S *Scientific Racism in Modern South Africa*.

While a technoscience lens to AI policy should address these histories and their residues, it should also attend to how the PC4IR report as a technology offers pathways to contest these histories by positioning South Africa as a leader of innovation in the 4IR. For example, the PC4IR report deftly begins by situating its vision within South Africa's own histories of technological innovation. It strategically discusses the Kingdom of Mapunguwe, a pre-colonial South-African state of approximately 5000 people, known for its class-based political order and sophisticated gold and ivory trading.[64] In doing so, the PC4IR report demonstrates how science and technology is not limited to the industrial capabilities of sixteenth century Europe, but also flows from the advanced civilisation of Mapunguwe and its sophisticated technological capabilities and international trade practices as early as the twelfth century.[65] This grounding of AI policy within pre-colonial histories of South Africa provides a strategic narrative to counter Euro-American understandings of technology as flowing from the West to the rest, and to enable people of South Africa in their efforts to become producers of technological knowledge and innovation in the 4IR.

A lens of law as technology through a technoscience approach enables an awareness of how the PC4IR report by rooting itself, albeit only briefly, in histories serves as a counter to Western understandings of technological and legal modes of knowledge production as only objective (and hence true) if they remain detached from past histories and their legacies. The United States' National Artificial Intelligence Research and Development Strategic Plan, for example, gives no mention of histories whatsoever.[66] The PC4IR report thus seemingly differs in its approach by attending to AI-based technology and AI policy not as separate sets of knowledge practices but as techno-legalities that are co-constituted. Although its historicising is commendable, the analysis here might be too generous though as the PC4IR report spends little time on situating its vision for the 4IR within past histories and more time on its key focus of ensuring economic growth.

The PC4IR report could be strengthened further with more elaboration and continual attention to how the governing of AI policy is embedded within such histories, in particular how innovation is gendered. Chirikure, Hall and Rehren contend that Mapungubwe metallurgy (male domain) and pottery (female domain) were, contrary to popular belief, not strictly separate technological domains.[67] While strict taboos forbade women from metal smelting spaces and men from pottery-making areas, these boundaries were relaxed within the shared space of the home.[68] Kalanga women assisted their husbands by pumping bellows during smelting, and Njanja women and children are reported to have assisted with metal smelting during times of high demand.[69] At the same time, although men were prohibited from entering firing localities, they contributed to earlier stages of the pottery-making production process.[70] The PC4IR report

64 *GG* 43834 at 135.
65 Ibid.
66 National Science and Technology Council (NSTC): 'The National Artificial Intelligence Research and Development Strategic Plan'.
67 Chirikure S, Hall S and Rehren T 'When ceramic sociology meets material science: Sociological and technological aspects of crucibles and pottery from Mapungubwe, Southern Africa' at 23–32.
68 Ibid.
69 Ibid. at 30.
70 Ibid. at 24.

deploys pre-colonial histories of Mapunguwe innovation as a discursive narrative to demonstrate South African leadership and expertise as a past and future producer of technology, but without an attention to these gendered relations the vision of 4IR remains limited and exclusive to men and male norms. AI policy that attends to intersectional gendered histories of knowledge production will provide a more valuable compass for guiding the 4IR into a future that meaningfully addresses past injustices of racialised gendered inequality, while recognising the contributions of women to the 4IR.

Asserting themselves as designers and makers of AI-based technologies, women are advancing innovation across Africa. Doctor Shamim Nabuuma Kaliisa, for example, founded the Ugandan femtech company, CHIL AI Group, which is an AI-guided female e-hospital providing women with AI-based technology for managing chronic female diseases such as testing and treatment for cervical cancer.[71] Debbie Rogers, CEO at Praekelt.org, also led the service design of the National Department of Health in South Africa's MomConnect service, which is a mobile phone app based partially on AI-technology that guides women through what to expect during their pregnancy and links them to their healthcare providers.[72] While not founded by women tech designers, more examples of Africa-based innovation in femtech are Sophie Bot (Kenya), which is a chatbot platform that answered questions on sexual and reproductive health, and Wekebere (Uganda) an AI-based mobile app and wearable belt for foetal monitoring.[73] Attention to the contributions of women experts such as these and to gendered histories and knowledge production will better enable AI policy to ensure that AI-technology into the future will support the needs and interests of women and those that identify outside the confines of binary gender.

2.4.3 *Address interconnections of gender and more-than-humans*

To promote a more sustainable vision of growth for South Africa in the 4IR, the PC4IR report must also address interconnections of gender and more-than-humans. A lens of law as technology through a technoscience approach enables an awareness of how the PC4IR report again differs from similar policies in the Global North in its noteworthy commitment to putting the 'human at the centre' of its development vision for the 4IR to resolve 'the nation's historical scars' that continue to manifest in a 'triple scourge' of poverty, unemployment, and inequality.[74] This human-centric approach is founded, however, upon a very narrow definition of the 4IR as 'an era where people are using smart, connected and converged cyber, physical and biological systems and smart business models to define and reshape the social, economic and political spheres.'[75] This definition flows directly from Klaus Schwab, who coined the present technological condition as the 4IR, which is said to differ from previous industrial revolutions by the exponential pace at which technological advances are emerging and transforming

71 Ugwuede K '"I am Every Woman": CHIL AI Group's Full-fledged Tech Shop for African Women'. I retain the use of the terms 'women' and 'female' as used by Chil AI Group but the use of these terms should be problematised further within the emerging femtech industry to ensure that they address transgender health care.

72 Banning-Lover R 'MomConnect Lets Expectant Mothers Know What to Expect'.

73 <https://wekebere.org/>.

74 *GG* 43834 at 121.

75 Ibid. at 247.

society. It is characterised by a fusion of technologies that, according to Schwab, are blurring the lines across the 'physical, digital, and biological worlds'.[76] The 4IR, however, is more than the use of new interconnected technologies. It also represents a shift in the relationship between technology and the human, and in ways of producing knowledge about the world. The PC4IR report recognises this as much when it says the 4IR presents 'a new concept of human life and identity'[77] but as a technology its application of the definition of the 4IR as informed by Schwab and the language of the World Economic Forum leaves little to no room for generating a human-centric approach that understands how conceptions of the 'human' are themselves deeply racialised and gendered, but also connected to more-than-human life.

Colonialism and apartheid violence have defined who is considered fully human by equating certain humans (read women and people of colour) as less than human, while simultaneously subordinating animal and plant life. Histories of slavery and their residues have reduced the bodies of Black men and women to mere tools of slave labour to ensure white capitalist supremacy. The bodies of women, especially Black and Indigenous women, have been characterised as mere vessels of reproductive labour.[78] Such practices were informed and justified by normative conceptions of rationality that have excluded women and people of colour as rational subjects by characterising them as closer to nature (for example animals and plants) and the body, thus denying them full personhood and participation in social, political, and economic life.[79] It is this link between who is considered fully human and the debasement of non-human life that becomes important to consider for understanding the limits of an AI policy that only centres the human and fails to consider other forms of life.

Colonial and apartheid modes of exclusion have been predicated upon delimiting human life as superior to non-human life, thus it becomes important to address hierarchies of gender through a multi-species approach that also attends to plants and animals. Through the writing of Aristotle, as Michael Marder demonstrates,[80] plants were characterised as the lowest order of life because of their lack of movement and uncontrolled growth. Animals were relegated further up on the hierarchy of life due to their proclivity for movement, sensation, and desiring appetite. Aristotle conferred supremacy only to certain humans (read: white and male) because of their ability to reason, generate language, and produce higher concepts of science and knowledge. Women were considered less capable of reason and rationality thus Western hierarchies of human exceptionalism are highly gendered.[81] Western conceptions of rationality and associated binaries of Man *versus* nature undergird innovation in the 4IR. Through Aristotle, man is defined as a rational animal meant to use reason to deduce the truth through formal rules of logic and, in turn, to rule over and control non-human life. Descartes further emphasised reason as a fundamental facet of personhood with his contention 'I think therefore I am', which further entrenched hierarchies of human versus non-human.

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76 Schwab K *The Fourth Industrial Revolution* at 7.
77 *GG* 43834 at 134.
78 Roberts DE *Killing the Black Body: Race, Reproduction, and the Meaning of Liberty*.
79 Lloyd at 150–152; Plumwood at 44–47; Wynter at 300–305.
80 Marder M *Plant-thinking: A Philosophy of Vegetal Life*.
81 Lloyd at 44–47.

Their writings inspired Enlightenment ideals of universality and the belief that mathematics could represent the relationships and truthfulness of every phenomenon. This view of personhood became foundational to AI and the development of a thinking machine to enhance or even surpass human intelligence.[82] While centring the human in AI policy helps to ensure that thinking machines do not supplant but rather support human wellbeing, an alternative framing might be to focus on a human and more-than-human centric approach that attends to networks of gender, race, plants, animals and minerals. The 4IR should not be just defined by the blurring of lines between the physical, digital, and biological spheres, but by the lessening of boundaries between human and more-than-human life and their relation to hierarchies of racialised gender.

Attending to the interconnections of gender and more-than-human life would enable a more meaningful vision of growth for South Africa in the 4IR. As the economic laden definition of the 4IR demonstrates, the PC4IR report creates too narrow a vision for the 4IR by linking innovation to economic competitiveness. Its dream for South Africa in the 4IR explicitly puts forward the 'wellbeing of her people' but the overwhelming focus is on economic growth of the nation-state. There is mention of 'inclusive growth' to be sure, but as Julie Livingston aptly argues in her parable foregrounding Botswana,[83] economic growth under capitalism becomes a 'self-devouring growth' that negatively impacts social well-being and upends efforts towards social equality. What is needed, she contends, is not better technology, but a greater accounting of the web of relationships between humans, non-human beings, plants and minerals that growth entails.

Take, for instance, the vision that the PC4IR report has for the future of agriculture in the 4IR. With the advent of precision agriculture there has been a shift towards the use of algorithmic-based software, sensors and farming equipment. The PC4IR report as a technology is deployed to emphasise how precision agriculture technologies will increase crop yields in the future and thus should be a key site for profitable investment.[84] To ensure that precision agriculture delivers benefits in equitable ways, it also stresses the need to promote reskilling and tertiary education programs to train workers on the use of such technologies.[85] The trouble though is that the PC4IR report as a technology is limited in its discussion of agriculture by not attending to gender, or considering how a more meaningful vision of growth may emerge if the health of plants (rather than just their crop yields) is addressed.

Agriculture remains a key industry on the African continent with 23% of sub-Saharan Africa's GDP coming from agriculture and with approximately 60% devoted to small-scale farming.[86] African women comprise a large portion of the agricultural work force, constituting between 60% and 80% of the total agricultural labour force.[87] In terms of precision agriculture, while the industry remains a male-dominated field, women tech developers have begun to contribute to precision agriculture innovations. For instance, Nazirini Siraji from Uganda designed the Farmers Companion App, which helps farmers fight the devastating effects of fall army worm on local maize

82 Mhlambi S 'From rationality to relationality: Ubuntu as an ethical and human rights framework for artificial intelligence'.
83 Livingston J *Self-Devouring Growth: A Planetary Parable as Told from Southern Africa*.
84 *GG* 43834 at 57.
85 Ibid.
86 Goedde L, Ooko-Ombaka A and Pais G 'Winning in Africa's Agricultural Market'.
87 AUDA-NEPAD: 'Agriculture in Africa: Transformation and Outlook'.

crops.[88] Using Google's Tensor Flow AI-based software in 2019, Siraji developed the mobile app to help farmers spot an infestation early and then suggest the appropriate treatment depending on the life cycle of the pest.

A technoscience approach to AI policy contends with much more than the role of women in agriculture and precision agriculture, but also with gendered processes of ownership and hierarchies of knowledge production. While precision agriculture offers tremendous benefits for detecting disease and for growing of crops with less water and fewer pesticides, it raises concerns over its use of farmers' knowledge and who owns the intellectual property rights over their data.[89] It may mean that women farmers will have fewer meaningful opportunities to own and protect their knowledge and expertise. While African women farmers hold expert knowledge about local soils, plants and animals, the ethos of algorithmic culture bestows greater value on AI-based technologies of precision agriculture as producing more exact, true and precise knowledge of farming. In turn, it reinforces nature and plants as objects of raw material to be managed and optimised further through precision agriculture. The devaluing of women's farming knowledge is thus integrally related to the denigration of non-human life. Precision agriculture after all works best with standardised rows of trees and plants for scanning and sensing. Thus, it is reinforcing monoculture farming. A more gender inclusive AI policy governing precision agriculture, therefore, would need an accounting of its impact on relations of gender as well as plant life.

Attending to the interconnections of gender and more-than-humans can encourage more critical ways of thinking about economic progress and the development of more meaningful models of growth that centre care and responsibility towards multiple modes of identity and networked forms of life. In the case of precision agriculture, addressing these connections brings the management of plants and farm labour into sharper focus. It incites inquiries into how AI-based technologies can enable growth away from monoculture crops towards protecting soil, water, land, plants and trees not as mere commodities and objects of property but as beings integrally related to the lives of humans (and technology). The future of food in the 4IR becomes a much different vision when care and responsibility are directed towards plants as precise and intelligent beings, not just as raw material or resource for food. Likewise, the future of health in the 4IR requires attention not only to racialised gendered health disparities, but also to the health of more-than-humans as their own worlds not just in service to humans.

2.5 Conclusion

Challenging narratives of techno-legal-optimism that guard the law from critical examination, this chapter develops and models a technoscience approach for understanding the PC4IR report as a technology. In doing so, it demonstrates how the PC4IR report deploys a rhetoric of South African politics that simultaneously confronts colonial and apartheid pasts, while reinforcing them through a narrow vision of the 4IR that leaves hierarchies of race and gender intact. Through a technoscience approach it then offers

88 Adrikos J 'Conquering the fall armyworm in Uganda'; Bell-Gorsia N 'Machine learning meets African agriculture'.

89 Foster L et al. 'Smart farming and artificial intelligence in East Africa: Addressing indigeneity, plants, and gender' at 1–10.

a fundamental rethinking of how the PC4IR report could promote a more meaningful vision and governing of AI-based technologies through an attention to gender as intersectional and multiple, to gendered histories of knowledge production, and interconnections of gender and more-than-humans.

2.6 References

Abrahams Y 'Gender and locating Sarah Baartman in the present' in Oliphant AW, Delius P and Meltzer L (eds) *Democracy X: Marking the Present, Re-Presenting the Past* (Pretoria: University of South Africa, 2004).

Adams R 'The gendered impact of artificial intelligence and the fourth industrial revolution in South Africa: Inequality, accessibility and skills development' in Pearson Jr W and Reddy V (eds) *Social Justice and Education in the 21st century: Research from South Africa and the United States* (Zurich, Switzerland: Springer Nature, 2021).

Adinde I 'Nigeria must invest in ICT education for youth empowermen' *This Day* (2018) <https://www.thisdaylive.com/index.php/2018/06/21/adinde-nigeria-must-invest-in-ict-education-for-youth-empowerment> (accessed 4 July 2023).

Adrikos J 'Conquering the fall armyworm in Uganda' *The Borgen Project* (10 January 2021) <https://borgenproject.org/tag/nazirini-siraji/> (accessed 7 July 2023).

African Declaration on Internet Rights and Freedoms (2015) <https://africaninternetrights.org/>.

Ahmed S 'A gender perspective on the use of artificial intelligence in the African fintech ecosystem: Case studies from South Africa, Kenya, Nigeria, and Ghana' paper presented at the *ITS Bennial* Conference, Gothenburg, Sweden (21 June 2021) <https://researchictafrica.net/wp/wp-content/uploads/2021/07/Final-Revised-AI4D-Gender-ITS-conference-paper.pdf> (accessed 7 July 2023).

Alfrey L & Twine FW 'Gender-fluid Geek Girls: Negotiating Inequality Regimes in the Tech Industry' *Gender & Society* 31 (2016) 28–50.

Alvarez-Nakagawa A 'Law as magic: Some thoughts on ghosts, non-humans, and shamans' *German Law Journal* 18 (2017) 1247–1275.

Atanasoski N and Vora K *Surrogate Humanity: Race, Robots, and the Politics of Technological Futures* (Durham: Duke University Press, 2019).

AUDA-NEPAD: 'Agriculture in Africa: Transformation and Outlook' South African Union Development Agency-NEPAD (2013) <https://www.nepad.org/caadp/publication/agriculture -africa-transformation-and-outlook> (accessed 7 July 2023).

Banning-Lover R 'MomConnect Lets Expectant Mothers Know What to Expect' *Financial Times* (17 May 2020) <https://www.ft.com/content/7d17d354-684e-11ea-a6ac-9122541af204> (accessed 7 July 2023).

Bell-Gorsia N 'Machine learning meets African agriculture' *Google Company News* (13 November 2019) <https://blog.google/technology/ai/machine-learning-meets-african-agriculture/> (accessed 7 July 2023).

Benjamin R *Race After Technology Abolitionist tools for the New Jim Code* (Medford, MA: Polity Press, 2019).

Beyene T and Frost R 'Gender variance and the gender digital divide' in Sey A and Hafkin N (eds) *Taking Stock: Data and Evidence on Gender Equality in Digitial Access, Skills, and Leadership* (Tokoyo, Japan: United Nations University, 2019).

Biagioli M and Buning M 'Technologies of the law/law as a technlogy' *History of Science* 57 (2019) 3–17.

Buolamwini J and Gebru T 'Gender shades: Intersectional accuracy disparities in commercial gender classification' *Proceedings of Machine Learning Research* 81 (2018) 1–15.

Burton P and Mutongwizo T 'Inescapable violence: Cyber bullying and electronic violence against young people in South Africa' (Cape Town: Centre for Justice and Crime Prevention, 2009).

Butler, J *Gender Trouble: Feminism and the Subversion of Identity* (New York: Routledge, 1999 [1990]).

Chinn J, Martin I, and Redmond N 'Health equity among Black Women in the United States' *Journal of Women's Health* 30 (2021) 212–219.

Chirikure S, Hall S and Rehren T 'When ceramic sociology meets material science: Sociological and technological aspects of crucibles and pottery from Mapungubwe, Southern Africa' *Journal of Anthropological Archaeology* 40 (2015) 23–32.

Chiweshe MK 'Fourth Industrial Revolution: What's in it for African Women?' Johannesburg: South African Institute of International Affairs (2019) <https://africaportal.org/publication/fourth-industrial-revolution-whats-it-african-women/#:~:text=This%20 policy%20briefing%20pro vides %20a,low%2Dskill%20and%20routinised %20professions> (accessed 7 July 2023).

Couldry N and Mejias UA *The Costs of Connection: How Data is Colonizing Human Life and Appropriating it for Capitalism* (Stanford, CA: Stanford University Press, 2019).

Dubow S *Scientific Racism in Modern South Africa* (Cambridge, MA: Cambridge University Press, 1995).

Eaglin J 'When critical race theory enters the law & technology frame' *Michigan Journal of Race & Law* 26 (2021) 151–168.

European Institute for Gender Equality (EIGE): 'Cyber Violence Against Women and Girls' (2017) <https://eige.europa.eu/publications/cyber-violence-against-women-and-girls> (accessed 7 July 2023).

Foster L, Szilagyi K, Wairegi A, Oguamanam C and De Beer J 'Smart farming and artificial intelligence in East Africa: Addressing indigeneity, plants, and gender' *Smart Agricultural Technology* 3 (2023) 1–10.

Garry A and Pearsall M (eds) *Women, Knowledge, and Reality: Explorations in Feminist Philosophy* 2nd edn (New York: Routledge, 1996).

Gilbert P 'MS Azure comes to rescue of on-the-brink rhinos' *ITWeb* (16 February 2018) <https://www.itweb.co.za/content/DZQ587VJ9z27zXy2> (accessed 5 July 2023).

Goedde L, Ooko-Ombaka A and Pais G 'Winning in Africa's Agricultural Market' *McKinsey and Company* (15 February 2019) <https://www.mckinsey.com/industries/agriculture/our-insights/winning-in-africas-agricultural-market> (accessed 7 July 2023).

Hamann R 'Developing countries need to wake up to the risks of new technologies' *The Conversation* (4 January 2018) <https://theconversation.com/developing-countries-need-to-wake-up-to-the-risks-of-new-technologies-87213> (accessed 5 July 2023).

IBM South Africa 'AI in the Fight Against Malaria' *ITWeb* (14 March 2018) <https://www.itweb.co.za/content/VgZeyvJAX2QqdjX9> (accessed 5 July 2023).

Jasanoff S (ed.) *States of Knowledge: The Co-production of Science and Social Order* (New York: Routledge, 2004).

Kanyua J 'Connecting Kenya: AI as a government tool to accelerate manufacturing sector growth' *Pan African Visions* (22 October 2018) <https://panafricanvisions.com/2018/10/connecting-kenya-ai-as-a-government-tool-to-accelerate-manufacturing-sector-growth/> (accessed 5 July 2023).

Lagarde C 'Looking ahead to chart today's course: The future of work in sub-Saharan Africa' *International Monetarty Fund* (17 September 2018) <https://www.imf.org/en/News/ Articles/2018/12/17/sp121718looking-ahead-to-chart-todays-course-the-future-of-work-in-sub-saharan-africa> (accessed 5 July 2023).

Laxton C 'Virtual world, real fear: Women's aid report into online abuse, harassment and stalking' *Women's Aid* (February 2014) <https://www.womensaid.org.uk/what-we-do/evidence-hub/virtual-world-real-fear/> (accessed 7 July 2023).

Livingston J *Self-Devouring Growth: A Planetary Parable as Told from Southern Africa* (Durham, NC: Duke University Press, 2019).

Lloyd G 'The man of reason' in Garry A and Pearsall M (eds) *Women, Knowledge, and Reality: Explorations in Feminist Philosophy* (New York, NY: Routledge, 1996).

Macaulay S 'The new versus the old legal realism: "Things ain't what they used to be"' *Wisconsin Law Review* 2 (2005) 365–404.

Malanga DF 'Tackling gender-based cyber violence against women and girls in Malawi amidst the COVID-19 pandemic' *Association for Progressive Communications* (28 June 2020) <https://www.apc.org/es/node/36765> (accessed 7 July 2020).

Marder M *Plant-thinking: A Philosophy of Vegetal Life* (New York: Columbia University Press, 2013).

Martin, E 'The Egg and the Sperm: How Science has Constructed a Romance based on Stereotypical Male-Female Roles' *Signs: Journal of Women in Culture and Society* 16 (1991) 485-501.

Mavhunga CC *The Mobile Workshop: The Tsetse Fly and African Knowledge Production* (Cambridge, MA: The MIT Press, 2018).

Mhlambi S 'From rationality to relationality: Ubuntu as an ethical and human rights framework for artificial intelligence' (Cambridge, MA: Carr Center for Human Rights Policy Discussion Paper Series, 2020) <https://carrcenter.hks.harvard.edu/publications/rationality-relationality-ubuntu-ethical-and-human-rights-framework-artificial> (accessed 7 July 2023).

National Science and Technology Council (NSTC): 'The National Artificial Intelligence Research and Development Strategic Plan' (2016) <https://www.nitrd.gov/pubs/national_ai_rd_strategic_ plan.pdf> (accessed 7 July 2023).

Nwannekanma B 'Nigerians need knowledge to benefit from innovations in financial services' *The Guardian* (23 January 2018) <https://guardian.ng/interview/nigerians-need-knowledge-to-benefit-from-innovations-in-financial-services/> (accessed 5 July 2023).

Oliphant AW, Delius P and Meltzer L (eds) *Democracy X: Marking the Present, Re-presenting the Past* (Pretoria: University of South Africa, 2004).

Ondili M 'Artificial Intelligence: Labour Gender Gap in Africa' (Nairobi, Kenya: Strathmore University Centre for Intelluctual Property and Information Technology Law, 2021).

Oyěwùmí O 'Visualizing the body: Western theories and African subjects' in Oyěwùmí O (ed.) *African Gender Studies: A Reader* (New York: Palgrave MacMillan, 2005).

Pearson Jr W and Reddy V (eds) *Social Justice and Education in the 21st century: Research from South Africa and the United States* (Switzerland: Springer Nature, 2021).

Phan T 'Amazon echo and the aesthetics of whiteness' *Catalyst: Feminism, Theory, Technoscience* 5 (2019) 1–38

Phan T 'Programming gender: Surveillance, identity, and paranoia' *Ex Machina' Cultural Studies* 37 (2022) 46–64.

Plumwood V *Feminism and the Mastery of Nature* (New York: Routledge, 1993).

Posel D 'Race as common sense: Racial classification in twentieth-century South Africa' *African Studies Review* 44 (2001) 87–113.

Power T 'New Law Protects Women Against Online Abuse' *GroudUp* (2022) <https://www.groundup.org.za/article/new-laws-extend-protections-against-gender-based-violence-online-spaces/> (accessed 3 June 2023).

Report of the Presidential Commission on the 4th Industrial Revolution (PC4IR report) *Government Gazette* 43834 (23 October 2020) <https://www.gov.za/sites/default/files/gcis_document/202010/43834gen591.pdf> (*GG* 43834).

Richardson SS *Sex Itself: The Search for Male and Female in the Human Genome* (Chicago, IL: University of Chicago Press, 2015).

Riles A 'A new agenda for the cultural study of law: Taking on the technicalities' *Buffalo Law Review* 53 (2005) 979–1033.

Roberts DE *Killing the Black Body: Race, Reproduction, and the Meaning of Liberty* (New York: Pantheon Books, 1997).

Ruvaga L 'Could Big Data Help End Hunger in Africa?' *VOA News* (30 May 2017) <https://www.voanews.com/a/could-big-data-help-solve-hunger-in-africa/3877562.html> (accessed 4 July 2023).

Schwab K *The Fourth Industrial Revolution* (United Kingdom: Portfolio Penguin, 2016).

Sey A and Hafkin N (eds) *Taking Stock: Data and Evidence on Gender Equality in Digitial Access, Skills, and Leadership* (EQUALS Research Group, led by The United Nations University, 2019) <https://i.unu.edu/media/cs.unu.edu/attachment/4040/EQUALS-Research-Report-2019.pdf> (accessed 7 July 2023).

Shaffer G 'The new legal realist approach to international law' *Leiden Journal of International Law* 28 (2015)189–210.

Snell R 'Ethical considerations for artificial intelligence' *SAP Africa News Center* (28 August 2018) <https://news.sap.com/africa/2018/08/ethical-considerations-for-artificial intelligence/> (accessed 5 July 2023).

Tilley H *Africa as a Living Laboratory: Empire, Development, and the Problem of Scientific Knowledge, 1870–1950* (Chicago, IL: University of Chicago Press, 2011).

Ugwuede K '"I am Every Woman": CHIL AI Group's Full-fledged Tech Shop for African Women' *Techcabal* (2 September 2020) <https://techcabal.com/2020/09/02/chil-ai-group-full-fledged-tech-shop-for-african-women/> (accessed 7 July 2023).

Van der Merwe D, Roos A, Erlank W, Eiselen S, Nel S, Mabeka Q, and Pistorius T *Information and Communications Technology Law* 3rd edn (Durban: LexisNexis, 2021).

Van Wichelen S 'Changing rights to family life: Biolegalities in the globalization of reproduction' *Socio-Legal Review* 12 (2016) 26–50.

Van Wichelen S 'Law as Antikinship: The Colonial Present in Global Surrogacy' *Catalyst: Feminism, Theory, Technoscience* 8 (2022) 1–21.

Weheliye AG *Habeas Viscus: Racializing Assemblages, Biopolitics, and Black Feminist Theories of the Human* (Durham, NC: Duke University Press, 2014).

Wynter S 'Unsettling the Coloniality of Being/Power/Truth/Freedom: Towards the Human, After Man, Its Overrepresentation – An Argument' *The New Centennial Review* 3 (2003) 257–337.

Chapter 3

Artificial intelligence and human rights in Africa

3.1 Conceptual analyses: artificial intelligence and human rights

3.1.1 *Artificial intelligence*

The many foundational ways of understating the concept of artificial intelligence (AI) encompass logic, probability, continuous mathematics, reasoning, perception, action, and learning; and it also touch on fields of microelectronics, robotics, and law (among other subjects). Broadly speaking, AI refers to any machine or program capable of recreating one or more elements of human intelligence.[1] It is where machines, artificial agents, and further complex systems mimic cognitive functions, such as reasoning, problem-solving, and learning, that humans would associate with their own.[2] It is seen to enable people to accomplish more by collaborating with smart software. One can think of it as 'putting a more human face on technology';[3] a technology 'that can learn from the vast amounts of data that are available in the modern world';[4] a type of technology 'that understands our kind of language and respond[s] in kind . . . [and] can see and interpret the world the way that we do'.[5] AI is generally considered a product of the Fourth Industrial Revolution (4IR).[6]

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1 Weaver JF *Robots Are People Too* at 1.

2 Pagallo U & Quattrocolo S 'The impact of AI on criminal law, and its twofold procedures' at 385.

3 DAT263x Courseware 'What is Artificial Intelligence? Course Introduction'.

4 Ibid.

5 Ibid.

6 The Fourth Industrial Revolution (4IR) is, simply put: the fourth major industrial era since the first Industrial Revolution which took place in the 18th century. Klaus Schwab asserts that the world has experienced four industrial revolutions: The *First IR* employed the use of steam engines for mechanical production; the *Second IR* utilised electricity and the concept of division of labour to create mass production; the *Third IR* (which grew in the middle of the last century) introduced information technology, and the automated production processes; and now we have the *Fourth IR*: the 4IR, where 'we witness a digital transformation that is pervasively impacting every work of life across the globe'. The 4IR uncovers the current technological revolution, witnessing a transformation that is inevitably affecting the way humans live, interact and work. The astounding confluence of emerged (and emerging) breakthroughs that is spanning extensive areas of endeavour, evidences this revolution. Some examples are artificial intelligence, e.g., machine learning (machine learning is a type of artificial intelligence (popularly abbreviated as AI) that provides computers with the ability to learn without being explicitly programmed. The process of machine learning is like that of data mining); robotics; nanotechnology; biotechnology; quantum computing (quantum computing is the area of study focused on developing computer technology based on the principles of quantum theory, which explains the nature and behaviour of energy and matter on

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AI has descriptive, prescriptive, and theoretical meanings. The task of giving AI a working definition should follow four requirements – similarity to the explicandum;[7] exactness; usefulness; and simplicity.[8] The term 'intelligence' should not be interpreted from a purely human-centric perspective as an intelligent being does not have to be human-like.[9] A definition of AI need not cover all common usages of the concept but should be unambiguous.[10] Also, a working definition of AI will require some contextualisation because AI is a 'mixture of multiple research fields, each with its own goal, methods [and] applicable situations'.[11] These fields may be related, or completely different from each other, so to indiscriminately refer to all of them as 'AI' would be a mistake. It is possible, therefore, that there is no one standard definition of the concept, and even a working definition may be wanting of descriptive, theoretical, or practical value. This could be why some scholars consider all discussion about defining AI to be a waste of time as it may realise unanticipated consequences produced by unquestioned assumptions,[12] or simply be a too hasty endeavour as the technology is still quite new.[13]

There is also no widely accepted definition of AI in the legal field.[14] Aside from the fact that this could be because there is no widely accepted definition within the field of AI itself, another challenge is that the vision for what AI could develop into, keeps shifting. It is also not established that there is need for AI to have a legal definition. However, by identifying the necessary and required conditions for any definition, a concept such as AI will require some delineation and therefore this will regulate its usage in legal framing, thinking and communication. It is important to state that no concept can be well-defined from its onset, and this is especially so for AI, which is

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the quantum 'atomic and subatomic' level); Blockchain (a digital ledger in which transactions made in bitcoin or another cryptocurrency are recorded chronologically and publicly); the Internet of Things (the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data); 3D-printing etc. The 4IR refers to a coming technological watershed that is predicted to rival the agricultural, industrial, and information revolutions (Schwab K 'The Fourth Industrial Revolution: What it means and how to respond World Economic Forum'.)

7 Explicandum means the fact, thing, or expression which is to be explained or explicated. 'The task of explication consists in transforming a given more or less inexact concept into an exact one. We call the given concept (or the term used for it) the explicandum.' See Carnap R *Logical Foundations of Probability*.

8 These four requirements are from the Probability Theory, originally set up by Carnap where he focused on inductive logic and inductive intuition and was constantly attempting to find new axioms and conditions for logical probabilities. See Carnap again. Wang adopts this theoretical framework to attempt a definition of AI: See Wang P 'On Defining Artificial Intelligence' at 11–37.

9 Bostrom N *Superintelligence: Paths, Dangers, Strategies*.

10 Monett D & Lewis CWP 'Getting clarity by defining artificial intelligence – a survey'.

11 Wang 28.

12 Ibid. at 6.

13 'Artificial Intelligence and the Future of Humans'.

14 See the following: Allen JF 'AI Growing Up: The Changes and Opportunities' at 13–23; Kirsh D 'Foundations of AI: The Big Issues' at 3–30; Hearst MA and Hirsh H 'AI's Greatest Trends and Controversies' at 8–17; Brachman RJ at 19–34; Nilsson NJ *The Quest for Artificial Intelligence: A History of Ideas and Achievements*; Bhatnagar S et al. 'Mapping Intelligence: Requirements and Possibilities' at 117–135; Monett and Lewis at 212–214.

primarily scientific and still expanding. Most phenomena emanating from science are first conceptualised as vague ideas and concepts that are fluid in nature.[15] This is partly why a widely accepted definition of AI in the legal field is still not fully established.

It is proposed that the basic ingredient of understanding AI is algorithms, which are described as 'encoded procedures of transforming input data into a determined output, based on specified calculations'.[16] They are simply 'formulas designed to calculate a particular result'[17] or a procedure for solving a problem in a finite number of steps.[18] Also, algorithms which model complex human performance, human thought processes, and can learn from experience, are considered by several legal analysts in this field to be an example of AI. When systems with these capabilities operate autonomously from humans, several established areas of law are also challenged.[19] The development of AI could also be defined as 'the creation of machines with the general human capacity for abstract thought and problem-solving'.[20]

Several supranational institutions have attempted to define AI. The African Union (AU) Commissioner for Human Resources, Science & Technology (HRST)[21] has defined AI as the creation of 'intelligent machines that simply work and react like humans'[22] but with 'a lower error rate compared to human beings if coded properly'.[23] Her definition of AI was the first definition of the technology issued by the AU and it was provided during the AU's consideration of strategies for disaster risk reduction on the continent.[24] The Organisation for Economic Co-operation and Development (OECD)

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15 Wang opines: 'The task of choosing a proper working definition is not unique to AI, but is in all branches of science, as well as in many other domains, though in most cases the choice is relatively obvious, so the decision is often simply declared, rather than justified with detailed arguments' at 3.

16 Barfield W & Pagallo U *Research Handbook on the Law of Artificial Intelligence* at 4.

17 Cormen TH et al. *Introduction to Algorithms* at 5–10; Knuth DE *The Art of Computer Programming* at 1–9.

18 'There are many different types of algorithms. Relatively straightforward algorithms may be used to perform mathematical calculations to compute an equation; to sort data, which can be useful for finding patterns and connections; or to classify data on the basis of specified criteria. These "traditional" algorithms run on computer code written by human programmers who understand their logical underpinnings and, if required, can explain how a particular decision was reached by demonstrating the inner workings of the system. However, modern algorithms and the manner in which they are used are becoming increasingly sophisticated.' Gillespie T 'The Relevance of Algorithms' at 167 and 192: Cited in McGregor L, Murray D & Ng V, 'International Human Rights Law as a Framework for Algorithmic Accountability'.

19 Barfield & Pagallo at 4.

20 McGinnis JO *Accelerating Democracy: Transforming Governance Through Technology*.

21 The HRST Department coordinates the AU programmes on human resource development, education, science, technology and promoting the youth development agenda.

22 Agbor SA AU <https://au.int/en/speeches/20190810/remarks-he-professor-sarah-anyang-agbor-auc-commissioner-hrst-ticad-vii-session>.

23 Ibid.

24 Ibid. 'Africa is fully aware that we cannot afford to miss the Digital Transformation and we strongly recommend improving ICT, AI and machine learning capacity including use of ICT platforms at all levels of education, to promote education access and quality, research, knowledge generation, and innovation on Disaster Risk Reduction. I strongly believe that AI and machine learning can help improve disaster relief programs and this will be beneficial to

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Principles on Artificial Intelligence which was adopted in May 2019 by 42 countries (none of which is African),[25] defines AI as 'a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations, or decisions influencing real or virtual environments'.[26] The OECD also recognises AI systems to be designed to operate with varying levels of autonomy.[27] At the level of the European Commission (EC), the High-Level Expert Group on Artificial Intelligence (HLEG on AI)[28] provides an academic approach to defining the technology. They describe AI systems as software (or hardware) systems designed by humans[29] that

> 'given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions'.[30]

From an international human rights law (IHRL) lens, the United Nations (UN) Secretary-General describes AI as

> 'not one thing only, but rather refers to a "constellation" of processes and technologies enabling computers to complement or replace specific tasks otherwise performed by humans, such as making decisions and solving problems . . . Artificial intelligence generally optimizes the work of computerized tasks assigned by humans through iterative repetition and attempt. That said, it is the language of the culture, of companies and of governments . . .'[31]

Several states have developed AI strategies and legal frameworks around AI. Therefore, some states have provided unique and peculiar insights to defining the technology.

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our member states. We are rolling out three continental strategies that focus on (i) Education (CESA 16–25); (ii) TVET and Skills Revolution; and (iii) Science, Technology, and Innovation (STISA-2024). We are also developing a comprehensive Digital Transformation Strategy for Africa. We have strong focus to forge South-South and North-South cooperation to enhance international partnerships, for a collective action to harness emerging technologies.'

25 OECD: 'Forty-two countries adopt new OECD Principles on Artificial Intelligence'.

26 OECD: 'Legal Instruments'.

27 Ibid.

28 The HLEG on AI was appointed by the EC with the main aim to support the implementation of the European AI Strategy. This includes the elaboration of recommendations on future-related policy developments and on ethical, legal and societal issues related to AI, including socio-economic challenges. The HLEG on AI is composed by 52 representatives from academia, civil society and industry. The first two outputs of the HLEG on AI are Ethics Guidelines for Trustworthy Artificial Intelligence and the definition of AI cited in this work.

29 Humans design AI systems directly, but they may also use AI techniques to optimise their design.

30 See Smuhana "Hi'h-Level Expert Group on Artificial Intelligence'.

31 United Nations General Assembly (UNGA) 73rd session item 74(b): 'Promotion and protection of human rights: human rights questions, including alternative approaches for improving the effective enjoyment of human rights and fundamental freedoms *Promotion and protection of the right to freedom of opinion and expression – Note by the Secretary-General*' (28 August 2018) at 3.

Reports on AI adoption in Africa have concluded that it has been low or absent,[32] as not many states in the region have 'legitimised' the technology. However, some African states are now building a modest acceptance of AI into different aspects of their governance structures and institutions. Mauritius became one of the first African countries to publish its 70-page AI national strategy.[33] Before defining AI, they demystified some notions around the technology by outlining how practical applications of AI can already be seen in several walks of life to support human capabilities and intelligence.[34] They also describe AI as having 'transcended from the science-fiction literature and movie baited utopia to . . . offering solutions to improve productivity . . . pushing the production frontier and GDP potential . . . in a way the steam engine or the internet have done in the past'.[35] In the Mauritian strategy, AI relates to systems that 'demonstrate behaviours associated with human intelligence: planning, learning, reasoning, problem solving, knowledge representation, perception, motion, and manipulation and, to a lesser extent, social intelligence and creativity'[36]. Several other African countries have also established their national AI strategies and/or policies (some of them include Botswana, Cabo Verde, Cameroon, Congo, Egypt, Equatorial Guinea, Eswatini, Gambia, Ghana, Madagascar, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Tunisia, Uganda, Zambia, Zimbabwe).[37] National strategies outside the continent have also defined AI. France, for example, considers AI as an 'evolving boundary, rather than a settled research field'[38] possibly with the ambition to understand and reproduce human cognition and creating cognitive processes that are comparable to those found in human beings.[39] Denmark recognises that AI is an 'experimental science'[40] based on algorithms, that is to say 'mathematical formulae'.[41] India has adopted a categorisation of AI into 'strong AI' versus 'weak AI' in its national strategy,[42] as did Germany.[43] Weak AI refers to 'simulated thinking', as in 'a system which appears to behave intelligently,

32 'Government AI Readiness Index 2019'.

33 Mauritius Artificial Intelligence Strategy (MAIS) Report by the Working Group on AI Ministry of Information Technology, Communication and Innovation: 'Home'.

34 Ibid. at 9 (e.g., via natural language processing, computer vision, chatbots and voice recognition technologies).

35 Ibid.

36 Ibid. at 10. MAIS marks the country's dedication towards making AI a cornerstone of its next development model.

37 UNESCO: 'Artificial Intelligence Needs Assessment Survey in Africa' at 23; OECD AI Policy Observatory: 'National AI Policies and Strategies'.

38 'Stratégie européenne pour l'intelligence artificielle / Vie publique.fr'.

39 Ibid.

40 The Danish Government, Ministry of Finance and Ministry of Industry, Business and Financial Affairs: 'National Strategy for Artificial Intelligence'.

41 Ibid. at 5 and 6.

42 Aayog NITI 'National Strategy for Artificial Intelligence #AIForAll' at 15.

43 The Federal Government of Germany 'Nationale Strategie für Künstliche Intelligenz *AI Made in Germany*: Artificial Intelligence Strategy' at 4. 'Strong' AI means that AI systems have the same intellectual capabilities as humans, or even exceed them. 'Weak' AI is focused on the solution of specific problems using methods from mathematics and computer science, whereby the systems developed are capable of self-optimisation. To this end, aspects of human intelligence are mapped and formally described, and systems are designed to simulate and support human thinking.

but doesn't have any kind of consciousness about what it is doing'.[44] 'Strong AI' means that the AI systems have the same intellectual capabilities as humans, or even exceed them.[45]

Private organisations have also influenced how AI is defined, particularly in terms of the specific applications and use cases of AI. The development and implementation of AI technologies are often driven by the industry; therefore, their interests and priorities have shaped how AI is conceptualised. For example, companies that specialise in natural language processing (NLP) may prioritise the development of AI systems that excel in language-related tasks, while companies focused on computer vision may prioritise visual recognition capabilities. These priorities have shaped the direction of AI research and development and influenced the definitions of what constitutes AI.[46] Moreso, through their lobbying and advocacy efforts, private organisations have used their influence to shape the definitions and parameters of AI even before such considerations are made by governments.[47]

The term AI has been queried within legal literature. One concern is the position that, because only humans are universally and legally recognised to have the ability of intelligence (demonstrated through rational thinking and human behaviour), all definitions of intelligence should relate to human intelligence.[48] However, while AI may not be attributed with the ability to think cognitively, there is considerable recognition of AI's ability to use 'intelligent agents' programmed to carry out tasks and achieve certain human and legal outcomes, such as helping to advance the right to health. For example, AI is used to diagnose patients using electronic health records, design treatment plans, mine medical records, and even predict wait-times for patients in emergency waiting rooms.[49] Problematically, as algorithms are replacing humans as decision-makers in certain areas, the use of AI has been implicated in fostering discrimination in education, housing, employment, immigration, and social services.[50] These types of discrimination all raise legal and human rights issues.

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44 Aayog.

45 Also, there is the categorisation of 'narrow AI' versus 'general AI' where narrow AI is one that describes an AI system that is limited to a single task or a set number of tasks. The classification of AI into 'strong' and 'weak', and 'narrow' and 'general' abounds in the literature. See Hildt E 'Artificial Intelligence: Does Consciousness Matter?' at 1535; Wei L *Legal risk and criminal imputation of weak artificial intelligence*.

46 E.g., IBM has been at the forefront of AI development for many years, and its work has helped to shape the definition of AI. IBM's work on cognitive computing and natural language processing, e.g., has helped to expand the scope of what is considered AI, beyond traditional rule-based systems.

47 Valle-Cruz D et al. 'A review of artificial intelligence in government and its potential from a public policy perspective'; Legg S and Hutter M 'A collection of definitions of intelligence' at 17.

48 Scherer MU 'Regulating artificial intelligence systems: Risks, challenges, competencies, and strategies' at 353.

49 Krittanawong C et al. 'Artificial Intelligence in Precision Cardiovascular Medicine' at 69; Vincent J 'Google is absorbing DeepMind's health care unit to create an AI assistant for nurses and doctors'; 'How IBM Watson Is Revolutionizing Cancer Research'.

50 Chander A 'The Racist Algorithm?' at 115; Newman N 'The Costs of Lost Privacy: Consumer Harm and Rising Economic Inequality in the Age of Google'; Miller CC 'When Algorithms Discriminate'.

In conclusion, the definitions of AI within law (and outside law) are still in a place of flux. AI has, however, been described as the most important technology on the planet,[51] because it has become so universal and relevant to a multitude of intellectual tasks. Conversely, AI has been described as a 'potent weapon'[52] and a 'double-edged sword'[53] especially in Africa.[54] This is related to how the law may be affected by AI's integration of technical and social attributes,[55] and how it poses a threat and challenge to people and society. On the one hand, AI can be appreciated as a tool (for example for national strategy)[56] and defined in terms of its use as a technology for, say, core competitiveness or security,[57] but on the other hand AI may be defined as an ideology and not a technology.[58] This is because AI may not delineate specific technological advances but may only reference a subjective measure of tasks that is classified as 'intelligent'.[59] Therefore the term AI could be adopted as a marketing ideology or a technology buzzword that references the various philosophies in the innovative use of computation.

3.1.2 *Human rights*

Despite its ubiquity in both academic and contemporary discourses, the term 'human rights' has no canonical meaning. It could be perceived as criterion-less.[60] In common parlance, however, the concept often refers to certain standards, principles and norms that allow people to live (and interact) with values of dignity, freedom, equity, and accord. As these values have extensive meanings (and are also extensive in their application), the concept of human rights simply refers to what human beings (should) enjoy (and are inherently entitled to) because they are human beings: the right to life, freedom from torture, personal security, food and water etc. The types and categories of human rights are abundant,[61] and they are mostly considered indivisible, interrelated,

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51 Barfield citing Choplin D's article 'AI Will Change Everything'.
52 Cui Y *Artificial Intelligence and Judicial Modernization* at ix.
53 Ibid. at xi.
54 'AI & Global Governance: AI in Africa is a Double-Edged Sword'.
55 Cui Y.
56 Allen GC *Understanding China's AI Strategy: Clues to Chinese Strategic Thinking on Artificial Intelligence and National Security*.
57 Ibid.
58 'AI is An Ideology, Not A Technology'.
59 Ibid.
60 'There are unusually few criteria for determining when the term is used correctly and when incorrectly – and not just among politicians, but among philosophers, political theorists, and jurisprudents as well.' See Griffin J *Griffin On Human Rights* cited in Perry MJ *A Global Political Morality: Human Rights, Democracy, and Constitutionalism* at 15.
61 Human rights have been categorised (though questionably) into civil and political rights; socio-economic rights, and collective rights or developmental and/or solidarity rights. Civil and political rights include norms that pertain to physical and civil security (e.g. abolition of torture and slavery, inhumane treatment, arbitrary arrest, and a recognition of equality before the law) as well as norms that pertain to civil and political liberties (such as freedom of thought, conscience, and religion; freedom of assembly and voluntary association; political participation through right of suffrage etc.). Socio-economic human rights pertain to norms required to meet social needs (e.g. the right to food, water, shelter, healthcare, education etc.) as well as norms that pertain to the provision of goods for economic wellbeing (such as the right to work and earn fair wages, an adequate living standard, social security net etc.).

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and interdependent on each other,[62] and not to be excluded from any one or other kind of person,[63] with most human rights being essential to the survival and the full development of individuals, peoples, and communities. Several human rights norms have gained universal recognition (alongside relativist adaptations),[64] and with some human rights having earned the status of international law,[65] there are also contingent duties for them to be observed and realised.[66]

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Collective or developmental or solidarity human rights include the right to self-determination of peoples (e.g. the right to cultural development and the enjoyment of their cultures, languages, and religions); this solidarity right also encompasses the right to peace, development, and a shared commitment to a healthy environment. See Vasak K 'For the Third Generation of Human Rights: The Rights of Solidarity'; Van Boven T 'Categories of rights' at 143–156; Pocar F 'Some Thoughts on the Universal Declaration of Human Rights and the Generations of Human Rights' at 43; Alston P 'A third generation of solidarity rights: progressive development or obfuscation of international human rights law?' at 307–322.

62 'All human rights are universal, indivisible, and interdependent and interrelated. The international community treat human rights globally in a fair and equal manner, on the same footing, and with the same emphasis' Vienna Declaration and Programme of Action, adopted by the World Conference on Human Rights on 25 June 1993: UN Doc. A/CONF. 157/23 (12 July 1993). See the UN Office of the High Commissioner for Human Rights (OHCHR): Vienna Declaration and Programme of Action.

63 Or persons, irrespective of their race, colour, sex, gender, language, religion or belief, political opinion, national origin, social class, socio-economic status, birth, sexual orientation, gender identity/expression, dis(ability), marital status, age, maternity and relationship status, indigeneity, ethnic origin, physical attributes etc.

64 Donnelly J 'Cultural relativism and universal human rights' at 400; Cobbah JAM 'African values and the human rights debate: An African perspective' at 309; Ibhawoh B 'Cultural Relativism and Human Rights: Reconsidering the Africanist Discourse' at 43–62; Renteln AD *International human rights: universalism versus relativism*; Donoho DL 'Relativism versus universalism in human rights: The search for meaningful standards' at 345; Reichert E 'Human rights: An examination of universalism and cultural relativism' at 23–36.

65 E.g., the UNGA adopted the UDHR on 10 December 1948. Written as 'a common standard of achievement for all peoples and nations', the UDHR for the first time in human history spelt out the human rights that all human beings should enjoy. Although with some criticisms in the literature, it has over time been widely accepted as the fundamental norms of human rights and a foundational text in IHRL (see Mutua M *Human rights: A political and cultural critique*; Dolinger J 'The Failure of the Universal Declaration of Human Rights' at 164. The UDHR, together with the International Covenant on Civil and Political Rights (ICCPR) and its two Optional Protocols, and the International Covenant on Economic, Social and Cultural Rights (ICESCR), form the so-called tripartite International Bill of Human Rights.

66 In achieving the respect for (and observance of) human rights, there is the legal obligation of States' duty to respect and observe human rights protection from any substantial infringements, the substance of which is defined in conventional or customary international law. E.g., under the UN Charter, art. 56 provides for the extent of human rights duties of all member States, which indicates that States retain some competence on human rights. To every human right there is an express or implicit correlative human duty owed. In theory, it is possible to posit that everyone cannot fully enjoy their human rights unless everyone fulfils their duties. Some human rights instruments have a 'duty clause' that sets out the duties of citizens and others to their society. E.g., UDHR art. 29(1) states: 'Everyone has duties to the community in which alone the free and full development of his personality is possible.' Also, the ACHPR arts 27–29 make detailed provisions for both State and individual duties. The ACHPR evidently recognises rights and duties as reciprocal.

Human rights are based on (and intended to assure) the realisation of human dignity.[67] Because every human has 'intrinsic worth',[68] human rights can be regarded as inalienable 'moral entitlements'.[69] Therefore, the enjoyment of human rights is neither contingent on a person's manners or virtue, nor wealth or political ideologies. The concept of universal human rights rests within the idea that each person is a subject of global concern.[70] Beyond the recognition of dignity, other cross-cutting themes of human rights are premised on social justice, human development, environmental protection, cultural recognition, gender equity and inclusive participation.[71] The scope and concept of human rights are still developing; constantly being negotiated; and finds relevance in various established and innovative fields (such as the role of 'human rights' in climate change adaptation or AI automation, for example).[72]

The concept of 'human rights' is not free from several ambiguities[73] and critiques.[74] It has gained its phenomenological expansion from the contributions of different branches of scholarship. Therefore, human rights have not been conceived in the same way by various schools of thought. Even though the 'natural scholars' conceive human rights as a 'natural' given – a concept that exists independently from social recognition,[75] 'deliberative scholars' see it differently. They encapsulate human rights to be in existence through legal constitutionalism.[76] There are also 'protest scholars' who see human rights as values that have been fought for (the 'protest school' is concerned with redressing injustices, and so human rights serves as a tool for seeking social justice by or on behalf of the unprivileged, the poor and the oppressed).[77] And, according to the

67 Minkler L *The state of economic and social human rights: a global overview* at 3.

68 Which is the noncontingent virtue that each human possesses simply by virtue of our humanity. See Gewirth A 'Human dignity as the basis of rights' at 10–28.

69 The use of the term 'moral' has been problematised in literature. According to Sen, the understanding of human rights as moral entitlements could reduce the concept to 'bawling upon paper' (citing Bentham J) which may also not be enforceable and so could pass as *faux* or pseudo-rights. See Sen A 'Elements of a Theory of Human Rights' at 316.

70 Beitz CR *The idea of human rights*.

71 OHCHR 'The Universal Declaration of Human Rights in six cross-cutting themes'.

72 Risse M 'Human rights and artificial intelligence: An urgently needed agenda' at 1–16.

73 E.g., the notion that 'human rights' are possessed by 'all human beings' simply by virtue of their humanity could be seen as mistaken because some rights are not possessed by all human beings but only by some, e.g., the rights of people living with disabilities, the rights of children, or women's rights. Also, not all human rights are legal rights in all legal systems.

74 E.g., Mutua has argued that the human rights enterprise incorrectly presents itself as a guarantor of eternal truths without which human civilisation is impossible. He also contends that the human rights corpus, though well meaning, is a Eurocentric construct for the reconstitution of non-Western societies and peoples with a set of culturally biased norms and practices. Mutua at 262. Also, some critics believe that the concept of human rights is too individualistic and legalistic, so that the structural causes of human rights violations, especially of economic and social rights are ignored. Going back in history, Jeremy Bentham argued that human rights ignored the social nature of moral and legal concepts. Even Karl Marx complained that it concealed and legitimated exploitative and oppressive social structures. See Freeman M *Human rights* at 206.

75 Dembour MB 'What are human rights-four schools of thought' at 1.

76 Ibid.

77 Ibid. at 3.

'discourse scholars', human rights only exist because people get to talk about them. They see human rights as a language that is used to express political claims.[78]

What we understand as human rights today has developed out of a process that included multiple political, philosophical, cultural and religious perspectives, including the perspectives from the Third World, which are not as commonly recognised in the literature.[79] With its dominant influence in international law, human rights norms are among the most legitimate standards in the world, as subscribing to them has given states great legitimating value within the international community.[80] One of the primary goals of the IHRLs regime is to promote human rights ideas and prevent human rights violations across the world. Therefore, an overwhelming majority of states in the international system have committed themselves to recognising and respecting the human rights norms embedded in IHRL treaties.[81] Even some repressive states have made substantial commitments to human rights recognition.[82] However, the ratifications of human rights treaties do not always translate into the enforcement of human rights norms in practice. On the other hand, state-centric approaches to evaluating the internalisation of human rights norms have also been queried as being inadequate, especially in the African context of human rights internalisation.[83]

IHRL is institutionalised by the UN Charter as a 'baseline' for recognising human rights and is the first universal treaty establishing international protection of human rights.[84] The Universal Declaration of Human Rights (UDHR) is proclaimed as a common standard for all peoples and all nations because it sets out (and did so for the first time) fundamental human rights to be universally protected. It has now been translated into over 500 languages.[85] The International Covenant on Civil and Political Rights

78 Ibid. at 4. See also Goodhart ME (ed.) *Human rights: politics and practice*; Ignatieff M *Human rights as politics and idolatry*.

79 E.g., Oh I 'Islamic Voices and the Definition of Human Rights' at 376–400 narrates how 'Muslim voices helped to fashion – and overwhelmingly approved – the most iconic statement on human rights in existence today'. See also Rajagopal B *International law from below: Development, social movements and third world resistance* who offers a fundamental critique of 20th-century international law from the perspective of Third World social movements.

80 Hafner-Burton EM, Tsutsui K & Meyer JW 'International Human Rights Law and the Politics of Legitimation: Repressive States and Human Rights Treaties' at 115–141.

81 There are 7 core international human rights treaties. Each of these treaties has established a committee of experts to monitor implementation of the treaty provisions by its State parties. Some of the treaties are supplemented by optional protocols dealing with specific concerns, e.g., the International Convention on the Elimination of All Forms of Racial Discrimination (ICERD), 1965; ICCPR, 1966; ICESCR, 1966; CEDAW, 1979; Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT), 1984; Convention on the Rights of the Child (CRC), 1989; and International Convention on Protection of the Rights of All Migrant Workers and Members of Their Families (ICMRW), 1990.

82 Hafner-Burton, Tsutsui & Meyer at 115–141.

83 Okafor OC *The African Human Rights System, Activist Forces and International Institutions* at 4.

84 With the goal to 'achieve international co-operation in solving . . . problems of an economic, social, cultural, or humanitarian character, and in promoting and encouraging respect for human rights and for fundamental freedoms for all' – Charter of the United Nations, 1941 art. 1(3).

85 OHCHR: 'Search by Translation'.

(ICCPR) (with its Optional Protocols)[86] is a crucial international human rights treaty, providing an array of protections for civil and political rights and requires the state parties who have ratified the treaty to preserve and protect fundamental rights such as the right to life and human dignity;[87] freedom of speech, assembly, and association;[88] equality before the law;[89] religious freedom and privacy;[90] freedom from torture, ill-treatment, and arbitrary detention;[91] the right to a fair trial;[92] right family life and family unity;[93] gender equality;[94] and minority rights.[95] The International Convention on Economic Social and Cultural Rights (ICESCR) is also one of the most influential international human rights documents, especially in the area of economic, social and cultural rights. It has given rise to international legal norms relating to a wide range of socio-economic justice causes.[96] Some of the rights enshrined in the ICESCR include the right to self-determination;[97] right to work in favourable conditions, with the recognition of workers' rights to organise and bargain collectively;[98] the right to an adequate standard of living which includes adequate food, adequate clothing, adequate housing and the need to be free from hunger;[99] the right to health care (to the highest attainable standard of physical and mental health);[100] the right to education, and to also benefit from scientific progress.[101] The ICCPR and ICESCR both require governments to take administrative, legislative, and judicial measures in order to protect the rights enshrined in the treaties and to provide effective remedies when they are violated.[102]

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86 There are two optional protocols to the ICCPR which gives additional human rights protections. The first optional protocol allows victims claiming to be victims of human rights violations to be heard. The Human Rights Committee, which is established by the Covenant, has the jurisdiction to receive, consider and hear communications from victims. The first optional protocol came into force with the Covenant. The second optional protocol aims to abolish the death penalty. It was entered into force on11 July 1991.

87 ICCPR, 1966 arts 6–8.

88 Ibid. arts 19, 21 and 22.

89 Ibid. arts 14 and 26.

90 Ibid. arts 17–19.

91 Ibid. arts 7–12.

92 Ibid. arts 14–16.

93 Ibid. arts 23–24.

94 Ibid. art 26.

95 Ibid. art 27.

96 Sital K, Getgen JE and Koh SA 'Enhancing enforcement of economic, social, and cultural rights using indicators: A focus on the right to education in the ICESCR' at 253.

97 ICESCR, 1966 art. 1.

98 Ibid. arts 6–8.

99 Ibid. art 11.

100 Ibid. art 12.

101 Ibid. arts 13 and 15.

102 UN Charter-based bodies, including the Human Rights Council (HRC), and bodies created under the international human rights treaties monitor State parties' compliance with their human rights treaty obligations. Charter-based bodies include the HRC, Universal Periodic Review, Special Procedures of the HRC, and the HRC Complaint Procedure. There are 10 human rights treaty bodies that monitor implementation of the core international human rights treaties. They include the Committee on the Elimination of Racial Discrimination; Committee on Economic, Social and Cultural Rights; Human Rights Committee; Committee on the Elimination of Discrimination against Women; Committee against Torture; Committee on the Rights of the Child; Committee on Migrant Workers; Subcommittee

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Moreover, the UDHR has been set as a foundation to encourage states to institute and promote the concept of solidarity rights[103] (a set of rights that recognise the importance of collective action and support for the well-being of individuals and communities, including in the call for a declaration on the right to international solidarity).[104] This is the same for the recognition of the right to development (R2D) as part of IHRL,[105] which asserts that every person and community has the right to participate in, contribute to, and benefit from economic, social, cultural, and political development. Supranational commitments such as the Sustainable Development Goals (SDGs), though not legally binding, have also been inspired by (and in turn inspire) the advancement of human rights norms and values.[106] For example, the global commitment to climate-change control and mitigation have adopted human rights objectives.[107] Aside from the various UN treaties and the three core documents that make up the International Bill of Rights,[108] regional instruments are also a part of IHRL.[109] The supervisory mechanisms of these regional systems could be seen as advancing human rights closer to individuals than the mechanisms at the level of the UN, perhaps because they also have judicial bodies who 'enforce' these rights at the regional level.[110] There are also sub-regional mechanisms like the human rights system of the Economic Community of West African States (ECOWAS) and its recognised field of community law across West Africa.[111]

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on Prevention of Torture; Committee on the Rights of Persons with Disabilities; and Committee on Enforced Disappearances. There are other UN bodies and entities involved in the promotion and protection of human rights. See OHCHR: 'Human Rights Bodies'.

103 Okafor OC 'Report of the Independent Expert on Human Rights and International Solidarity'.

104 'UN expert urges adoption of draft declaration on international solidarity'.

105 Declaration on the Right to Development GA Res 41/28, UNGAOR, 41st Sess, Supp No 53, UN Doc A/RES/41/128 186; OHCHR: 'Declaration on the Right to Development'; Okafor OC 'A Regional Perspective: Article 22 of the African Charter on Human and Peoples' Rights'.

106 Saiz I & Donald K 'Tackling inequality through the Sustainable Development Goals: human rights in practice' at 1029–1049; Pogge T & Sengupta M 'Assessing the sustainable development goals from a human rights perspective' at 83–97.

107 Mayer B 'Human rights in the Paris Agreement' at 109–117.

108 See the UDHR, Mutua and Dolinger.

109 See the European Convention for the Protection of Human Rights and Fundamental Freedoms (EHCR), 1950; The American Convention on Human Rights, 1969; and the African Commission on Human and Peoples Rights (ACHPR), 1981.

110 The judicial body in the European system is primarily the European Court of Human Rights. For the Inter-American system, there is the Inter-American Commission on Human Rights as well the Inter-American Court of Human Rights. The African system has the ACHPR as well as the African Court of Justice and Human Rights.

111 Officially referred to as the Community Court of Justice (CCJ) of the ECOWAS. Hereinafter referred to as 'the ECOWAS Court' or 'the Court.' The 2005 ECOWAS Supplemental Protocol expands the jurisdiction of the CCJ to hear human rights cases and enlarges the admissibility rules to include disputes between individuals and their own member states. As a result of these amendments, the Court can consider cases brought by individuals on application for relief for violation of their human rights; individuals and corporate bodies to determine whether an ECOWAS official has violated their rights; member states and the Executive Secretary, to bring an action against a state for failure to fulfil treaty obligations and member states, the Council of Ministers, and the Executive Secretary for determination of the legality of any action related to ECOWAS agreements. (Supplementary Protocol

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There is now a need to give some specific attention to the human rights system in Africa: The African system,[112] despite having its challenges,[113] has made some unique contributions to the promotion and protection of human rights. For example, the African Commission on Human and Peoples' Rights (ACHPR) recognises not only the rights of the individual but also the rights of collectives.[114] This speaks to the African concern for a more communal view of the world than that favoured by the majority in the West, as opposed to an atomistic individual framework for well-being.[115] The ACHPR also recognises the R2D as a justiciable right,[116] with the ACHPR upholding the same in a *locus classicus* case.[117] The ACHPR also contains the first and perhaps only binding international legal obligation on any state to guarantee a right to a satisfactory

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A/SP.1/01/05 Amending the Preamble and arts 1, 2, 9 and 30 of Protocol A/P.1/7/91 relating to the CCJ and art 4 Para 1 of the English version of the said Protocol).

112 The African system for protection and promotion of human rights is really the third of the well-established human rights systems, following the European system that came about in the 1950s, and the Inter-American system that really took off in the 1960s and 1970s.

113 Not unique to the African system but the domestication of the norms by some African states remains incomplete. Also, some decisions from the ACHPR and the African Court have been met with no implementation, thereby frustrating some of the human rights organs. The Executive Council (of the AU) who is the Minister of Foreign Affairs, once insisted that a decision that the ACHPR took be reversed. IJRC: 'African Commission Bows to Political Pressure, Withdraws NGO's Observer Status'.

114 *Katangese Peoples' Congress v Zaire* (2000) AHRLR 72 (ACHPR 1995) and *Gunme and Others v Cameroon* (2009) AHRLR 9 (ACHPR 2009). In the case against the Democratic Republic of the Congo (DRC) (Zaire as it then was), the ACHPR clarified that the Katangese, a group that wanted to secede from the territory of the mainland, constituted people on ethnic, linguistic grounds. But later on, in a case concerning Cameroon and the southern Cameroonians, an Anglophone group (that asserted also their right to be treated more fairly and also among them people who wanted to secede from the state of Cameroon) the Commission said they looked differently and said: but it's not necessarily ethnically based this concept of people, it could be merely a collection of people that foment and kind of see themselves grouped together on the basis of loyalty and cause and ideology (Viljoen F 'Africa's contribution to the promotion and protection of human rights').

115 Viljoen F 'Africa's contribution to the development of international human rights and humanitarian law' at 18.

116 ACHPR arts 21–24. The R2D is included in the Charter as a right equal to all other rights (not just a Declaration as with the UN). In other words, it is a justiciable right.

117 *Centre for Minority Rights Development (Kenya) and Minority Rights Group International on behalf of Endorois Welfare Council v Kenya, ACHPR* Communication No. 276/03, 25 November 2009. The Endorois is an indigenous community. They lived since ancestral times in one area of the country, beautiful area, Lake Bogoria, but they were evicted to make room for a nature reserve. And in the process, they were not adequately consulted, and their livelihood was detrimentally affected by this forced displacement. The claim by this community against Kenya led to Kenya being held accountable for having infringed the R2D. And this case shows that the R2D has both a substantive element, that your livelihood, your being, your totality of being is affected by government action. But it's also procedural, the way in which government does so, the lack of consultation, of consent by the community. And it is the confluence of those two elements that really showed what added advantage the right of development brings to the human rights discourse (Viljoen 'Africa's contribution to the promotion and protection of human rights).

environment.[118] As stated previously, there are detailed provisions for both State and individual duties under the ACHPR, recognising that rights and duties are reciprocal.

Today, the concept of human rights seems so familiar that we need to remember how new it is.[119] The 4IR is not only complicating the concept of human rights, but also the application and legitimacy of them. New technologies and applications that use AI are redesigning the human rights landscape by shifting the scope of what human rights are and even redefining who is 'human', what rights are now enforceable, and how. While AI may be used as an enabler of some human rights, there are issues around how AI may perpetuate technological racism, gender discrimination, identity erasure, algorithmic bias, and commit serious human rights abuses in Africa.[120] Beyond problem identification, it will also be important to harness the potential of ideologically principled activist movements that include feminist and other human rights approaches (to perhaps dismantle the hierarchies of power that comes with the use of AI for example through surveillance control), but importantly to initiate a flexible approach to understanding the technology's role in advancing human rights or otherwise on the continent.[121]

3.2 The dichotomous impact of artificial intelligence on human rights in Africa

The impact of AI on human rights is one of the most critical issues defining the 4IR. In Africa, the AI footprint is still negligible and nascent (compared to other regions of the world) but there is growing evidence to demonstrate how the technology is already impacting on human rights, at times in polarising ways.

On a positive note, the use of AI can help advance the realisation of human rights in Africa. This is certainly the case in connection with the effort to advance economic and social rights on the continent. For example, Rwanda's anti-epidemic robots are assisting the right to health by supporting the country's Covid-19 public health interventions.[122] The robots named Akazuba, Ikirezi, Mwiza, Ngabo, and Urumuri are deployed for mass temperature screening, monitoring patient status, and keeping medical records of Covid-19 patients.[123] In Rwanda, there is also a universal primary health care service that uses an AI-powered triage and symptom-checker platform to expand diagnosis for citizens.[124] Fully automated drone delivery programs are running in Tanzania and Rwanda, some of which deliver medicine and blood to otherwise difficult-to-reach areas.[125] The Cameroonian government is supporting the creation of AI-powered

118 ACHPR art. 24.
119 Freeman at 201.
120 Birhane A 'Algorithmic Colonization of Africa'.
121 This analysis will therefore engage on the relevant corpus of IHRL including the ACHPR and its Protocols such as the Protocol on the Rights of Women in Africa (Maputo Protocol) and the Protocol on the Rights of Persons with Disabilities in Africa.
122 Salaudeen A 'Rwanda has enlisted anti-epidemic robots in its fight against coronavirus'.
123 Ibid.
124 'Artificial intelligence to revolutionise health in lower-income countries'.
125 'Life-Saving Drones Fly Medicine to Tanzania's Remotest Spots'; Fortune 'How Delivery Drones Are Saving Lives in Rwanda'.

'made in Cameroon' drones for human rights and health services.[126] Kenya's Ministry of Health is adopting blockchain technology with the use of AI to advance drug safety and combat the problem of counterfeit drugs in the country.[127] This project involves the use of blockchain technology to create a tamper-proof system for tracking and verifying the authenticity of drugs in the supply chain. The system allows for real-time monitoring and tracking of drugs from the manufacturer to the patient, which can help to prevent the circulation of counterfeit drugs in the market.[128] Also, a social enterprise in Kenya has developed an AI application that allows for a non-invasive, time-efficient and tamper-proof approach to assessing children's malnutrition levels by using a facial recognition and processing algorithm.[129] In Nigeria, medical researchers are undertaking clinical trials using AI to detect early signs of anomalies such as asphyxia or brain-injury by analysing the cries of new-born babies.[130] In that same country, proprietary electronics sensors are being used by a group to collect soil data (moisture, nutrients, pH etc.) for uploading to a cloud server, where it is analysed by algorithms, and advice is fed back to them on what to do to maximise crop yield.[131] In rural Tanzania, farmers who have struggled with maintaining consistent food production are now using a machine-learning model that can diagnose early stages of disease in the cassava plant (an important staple crop in the region).[132] Using their phones (without needing access to the internet), these farmers can intervene to save their plants and boost crop production.[133]

In terms of civil and political rights, some 'activist forces'[134] in the region are using AI to expand civic engagement by employing the technology for public opinion monitoring and to perform data analysis which provides them with unprecedented categories

126 'Made-In-Cameroon Drones Are Taking To The Skies – And A Certain 26-Year-Old Is Leading The Charge'.

127 Ministry of Information, Communication and Technology of Kenya: 'Emerging Digital Technologies for Kenya: Exploration and Analysis' at 19.

128 Ibid.

129 Matchar E 'Can AI Tell if a Child Is Malnourished?'; 'Kimetrica'.

130 Onu CG et al. 'Neural Transfer Learning for Cry-based Diagnosis of Perinatal Asphyxia'; Onu CG et al. 'Ubenwa: Cry-based diagnosis of birth asphyxia'; Onu CG *Harnessing infant cry for swift, cost-effective diagnosis of perinatal asphyxia in low-resource settings*.

131 Zenvus: 'Startup'.

132 'The future of AI research is in Africa'.

133 Zenvus 'Intelligent solutions for farms and gardens'.

134 Okafor *The African Human Rights System, Activist Forces and International Institutions* at 3: 'The expression "activist forces" refers to the activist judges and civil society actors (CSAs) who openly . . . challenge . . . and continue to fight to ameliorate human rights violations . . . activist because they tend to possess this "resistance character", it is worthwhile to note, even at the outset, that the activist orientation of any of these actors does not settle the question of the nature of its political ideology. While most of these activist forces will be considered by most observers as progressive rather than regressive elements, this cannot always be said for every such actor. To be clear, reference to CSAs . . . (as a sub-group of activist forces) are meant to include one or more of the following: self-professed human rights CSAs, activist lawyers, women's groups, faith-based groups, trade unionists, university students . . . professional groups (such as the Nigerian Bar Association), independent journalists and other actors.'

of evidence to drive their activism.[135] One activist group in Nigeria uses AI to monitor hate speech on social media, in real-time, to predict the possible occurrence of violence.[136] In Uganda, machine learning is used to analyse radio content for civic engagement and to respond to refugee crises and other kinds of forced displacement.[137] AI drones have also been used to assess the needs of displaced populations, such as those fleeing conflict and persecution in Mali, Nigeria and South Sudan.[138] In Mali, AI forecasting tools have predicted conflicts arising from water insecurity.[139] As innovatory, AI has been used to detect the locations of gunshots in South Africa,[140] and the Malawian government has approved the use of AI-powered drones to save elephants.[141]

Much less positively, AI systems have been used to perpetrate human rights violations in Africa. Many Africans have suffered human rights violations arising from the use of AI (by perpetrators from within and outside the continent), at times leading to extreme outcomes. In 2018, it was revealed that voter suppression had been executed by foreign corporate outfits, through the use of AI software, with the goal of spreading disinformation and manipulating millions of people during national elections in Nigeria, Kenya, South Africa, Gabon, and Zambia (among other countries).[142] For example, serious concerns about data privacy in Kenya were raised in light of the electoral process in 2017, where a company known as Cambridge Analytica was accused of tampering with Kenya's voting systems leading to the question of whether the constitutionally guaranteed rights of Kenyan citizens may have been violated during the 2013 and 2017 presidential election.[143] There are also numerous accounts of how AI systems have been designed and/or deployed in ways that (whatever the intent) have led to the disproportionate disenfranchisement of all-too-many Africans, thereby impeding their enjoyment of certain human rights. For example, much facial recognition software is unable to 'see' people with darker skin or people of African descent, thereby rendering

135 EY & Microsoft 'Artificial Intelligence in Middle East and Africa: Outlook for 2019 and Beyond'.

136 'Home'.

137 'Using big data and machine learning to respond to the refugee crisis in Uganda'.

138 Ibid.

139 'The Water, Peace and Security PartnershipIHE Delft Institute for Water Education'.

140 'South Africa adopts new audio tech to find location of gunshots and immediately alert police'. South Africa is the first country after the United States to implement 'shotspotter' audio technology, used to fight wildlife poaching in the Kruger National Park and gun violence on the Cape Flats.

141 'Elephants Under Attack Have An Unlikely Ally: Artificial Intelligence'.

142 Wylie C (Mindf* ck) *Inside Cambridge Analytica's plot to break the world*; Kaiser B *Targeted: The Cambridge Analytica whistleblower's inside story of how big data, Trump, and Facebook broke democracy and how it can happen again*; Seadle M 'The Great Hack' (documentary film). Produced and directed by Karim Amer and Jehane Noujaim, Netflix, 2019. 1 hour 54 minutes'.

143 Abe O and Eurallyah AJ 'Regulating Artificial Intelligence through a human rights-based approach in Africa'. As quipped by Abe and Eurallyah: 'The Kenyan government engaged the services of Cambridge Analytica to access and analyse the data of millions of Kenyans on Facebook, Twitter, and Google in a bid to determine and manipulate their political views on the incumbent presidency. This confirmed that online radicalisation can be propagated by a deliberate strategy of violating peoples' online personal private data, misinformation, and manipulation by AI solutions in order to sway their political views in favour of an otherwise unpopular government.'

them all but invisible in those contexts.[144] A study found that the accuracy of gender classification systems varied widely depending on factors such as skin tone. Some AI systems were found to be most accurate for lighter-skinned males and least accurate for darker-skinned females and this is as a result of biased training data and algorithms that reinforce societal biases and stereotypes.[145] In 2015 an algorithm that applied automatic labels to pictures, classified some Africans as gorillas.[146] Even some machine learning algorithms have picked up ingrained racial prejudices which are concealed within the patterns of language use.[147] AI systems used in some hiring processes have disenfranchised qualified African candidates from gaining employment due to insignificant factors such as the 'African-sounding' names on their resumes.[148] Similar algorithmic discrimination and bias has sometimes occurred when Africans have sought social security and life-saving services,[149] especially in several instances where AI was being used in decision-making about the conferment or denial of refugee status, or in immigration processes (where there is now evidence that such AI tools have been prone to bias and errors, and have had negative impacts on individuals' human rights, particularly for several Africans who are marginalised or vulnerable).[150] The AI-powered facial recognition surveillance system in Uganda,[151] and Zimbabwe's facial recognition program (backed by China's Belt and Road initiative),[152] have both been criticised for aggressively mining data from citizens and breaching their right to privacy.[153] South Africa's normalisation of AI-powered surveillance is erecting apartheid-era segregation and punishment under the guise of security.[154] This is because the deployment of some smart AI CCTV networks in affluent areas of South Africa to detect suspicious behaviour and crime, disproportionately targets and criminalises black and working-class individuals, while reinforcing existing biases and stereotypes. This raises concerns about the lack of transparency and oversight in the development and deployment of these AI

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144 Buolamwini J & Gebru T *Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification*; Lohr S 'Facial recognition is accurate, if you're a white guy'; Raub M 'Bots, bias and big data: artificial intelligence, algorithmic bias and disparate impact liability in hiring practices' at 529.

145 Ibid.

146 Mulshine M 'A major flaw in Google's algorithm allegedly tagged two black people's faces with the word "gorillas"'.

147 'AI programs exhibit racial and gender biases, research reveals'.

148 Cediey E and Foroni F 'Discrimination in access to employment on grounds of foreign origin in France'; World Economic Forum: 'Here's why you didn't get that job: your name'.

149 Osoba OA & Welser W IV *An intelligence in our image: The risks of bias and errors in artificial intelligence*; Hacker P 'Teaching fairness to artificial intelligence: Existing and novel strategies against algorithmic discrimination under EU law'; Johnson K, Pasquale F & Chapman J 'Artificial intelligence, machine learning, and bias in finance: toward responsible innovation' at 499.

150 Molnar P & Gill L 'Bots at the Gate: a human rights analysis of automated decision-making in Canada's immigration and refugee system'.

151 'Uganda installs Huawei's AI-powered facial recognition surveillance system "nationwide"'.

152 Burt C 'Implementation of CloudWalk facial recognition technology in Zimbabwe progressing in stages'.

153 'China Is Exporting Its Digital Surveillance Methods to African Governments'; New report by Algorithm Watch: 'Identity-management and citizen scoring in Ghana, Rwanda, Tunisia, Uganda, Zimbabwe and China'; Gravett W 'Digital neo-colonialism: The Chinese model of internet sovereignty in Africa'.

154 'Smart CCTV Networks Are Driving an AI-Powered Apartheid in South Africa'.

systems (as well as the potential for these AI systems to be used for political repression or surveillance).[155] More so, the governments of Botswana, Kenya, Morocco, Nigeria,[156] Zambia and Zimbabwe have been accused of deploying AI tools for the surveillance of their citizens, including to spy on the communications of opposition figures, journalists, and protesters, thereby violating the human rights to privacy and safety, among other rights.[157]

Part of the reason why the use of AI may tend to perpetuate, reproduce, or exacerbate discrimination (deliberately or accidentally), is in part because, just like many tools, it reflects the human biases, inconsistencies, and limitations of the individuals behind them, or of the ecosystem around their creation and sustenance.[158] Bias in AI algorithms can emanate from unrepresentative or incomplete training data or the reliance on flawed information that reflects historical inequalities.[159] Therefore, even without the deliberate intention to discriminate, biased algorithms have led to the perpetuation of technological racism, inequality, injustice, and the marginalisation of Africans.[160]

So, in terms of human rights in Africa, the use of AI can be seen as having both positive and negative dimensions.[161] However, the local development of the technology is only marginal. For instance, Nigeria is one of the most technologically advanced countries in Africa but more than 90 % of the technological software used in the country is imported.[162] It is important to note that most of the AI systems operating within Africa are adopted, imported, or even hosted, from abroad. The foreign domination on the use of AI in Africa has been theorised as being somewhat reminiscent of traditional imperialism, though only to an extent. For, instead of being driven by hegemonic forces using brute force and domination,[163] 'algorithmic colonialism' is taking less detectible and more techno-evangelist forms, using AI.[164] The 'invisibility,' and displacive nature of AI poses a challenge for how the technology is legitimised and regulated. With its growing footprint across various fields in Africa, the use of AI is escalating and having huge impacts on human rights. Yet, its legitimation (at least in terms of laws that recognise and regulate the technology) is not keeping pace.

155 Ibid.
156 'Investigation: How Governors Dickson, Okowa spend billions on high tech spying on opponents, others'.
157 'Running in Circles: Uncovering the Clients of Cyberespionage Firm Circles'.
158 See Buolamwini & Gebru; Birhane.
159 E.g., although not evidently employed in Africa yet, automated risk assessments that have been used by judges to determine bail and sentencing limits have generated incorrect conclusions, resulting in large cumulative effects on certain groups, like African-Americans, and longer prison sentences or higher bails imposed on them; 'AI is sending people to jail – and getting it wrong'.
160 Birhane.
161 Even though the technology is not inherently good or bad but depends on how it is developed or used. See the discussion of whether artefacts and technologies can be political in themselves (independent of their use) in Winner L 'Do Artifacts Have Politics?'
162 Commons K 'Digital colonialism and the Internet as a tool of cultural hegemony'; Kwet M 'Digital colonialism: US empire and the new imperialism in the Global South' at 3–26.
163 See Birhane; Commons; Kwet. See also Irwin R 'Decolonising technological futures: a dialogical tryptich between Te Haumoana White, Ruth Irwin, and Tegmark's artificial intelligence'.
164 Ibid.

Even as international human rights standards are widely advised, they may not be comprehensive enough to fulfil the regulatory, legal, and ethical responsibilities that is required of the budding technology. This is perhaps why in September 2021, the United Nations High Commissioner for Human Rights (UNHCHR) proposed that any AI applications that cannot be operated in compliance with IHRL should be banned,[165] and moratoriums imposed on the sale and use of AI systems that carry a high risk for the enjoyment of human rights.[166] The UN High Commissioner recommends the application of core human rights principles such as equality and non-discrimination, participation and accountability, and principles that are also at the heart of the SDGs[167] and the UN Guiding Principles on Business and Human Rights.[168] More so, according to her, requirements of legality, legitimacy, necessity and proportionality should be consistently applied to AI technologies,[169] ensuring that key elements of availability, affordability, accessibility and quality are achieved;[170] and that access to effective judicial and non-judicial remedies should be available to those who suffer human rights violations and abuses relating to the use of AI.[171]

Apart from the capitalistic push for Africa to adopt more use of AI,[172] several African state institutions, showing politically motivated optimism and naivety, have voluntarily adopted forms of AI (without engaging the extant evidence that demonstrates how Africans, as part of the Third World and an 'undersampled majority',[173] are particularly

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165 A/HRC/48/31. HRC Forty-eighth session (13 September–1 October 2021). Annual report of the UNHCHR: 'The right to privacy in the digital age'. The report was submitted pursuant to HRC resolution 42/15, in which the Council requested the UNHCHR to organise an expert seminar to discuss how artificial intelligence, including profiling, automated decision-making and machine-learning technologies may, without proper safeguards, affect the enjoyment of the right to privacy, to prepare a thematic report on the issue and to submit it to the Council at its 45th session.

166 Annual report of the UNHCHR paras 45, 46 and 59. The UNHCHR also recommends a moratorium on the use of remote biometric recognition technologies in public spaces (at least until the authorities responsible can demonstrate compliance with privacy and data protection standards). Although she did not make any specific reference to self-driving cars, but she recommends enhanced efforts to combat discrimination linked to the use of AI systems by States and business enterprises, including by conducting, requiring, and supporting systematic assessments and monitoring of the outputs of AI systems and the impacts of their deployment. The UNHCHR recommends that States and business enterprises systematically conduct human rights due diligence throughout the life cycle of the AI systems they design, develop, deploy, sell, obtain, or operate.

167 UN: 'The 2030 Agenda for Sustainable Development'. The SDGs or Global Goals are a collection of 17 interlinked global goals designed to be a 'blueprint to achieve a better and more sustainable future for all'. The SDGs were set up in 2015 by the UNGA and are intended to be achieved by the year 2030 (accessed 14 March 2023).

168 OHCHR: 'Guiding Principles on Business and Human Rights: Implementing the United Nations "Protect, Respect and Remedy" Framework'.

169 A/HRC/48/31 para 38. See also A/HRC/43/29 para. 41.

170 Ibid. See also the detailed analysis of the role of new technologies for the realisation of economic, social, and cultural rights in A/HRC/43/29.

171 Ibid. See also the ICCPR art. 2(3) and Guiding Principles on Business and Human Rights principle 15(c) and pillar III.

172 'Artificial Intelligence: the urgency for Africa'.

173 Buolamwini & Gebru at 77–91: The 'undersampled majority' is a term coined by Buolamwini and means a group of people who are unlikely to succeed because the environment is hostile towards them e.g., people of African descent, women, people living with disabilities, LGBTQI individuals, and any community that has been marginalised in the tech industry'.

exposed to the human rights dangers of AI). Even where regulatory guidelines are put in place, they are largely copied from other jurisdictions (mainly the West), and several times lack an African perspective.[174] As a product of the 4IR, the capacity for AI to permeate different countries and sectors within Africa, albeit with limited legal institutional legitimacy, could be partly due to the phenomenon of globalisation. The quickening pace of technological globalisation makes it difficult for the regulatory authorities to fully 'catch-up' with AI and mobilise the technology for social gains.[175]

3.3 Human rights regulatory responses to artificial intelligence in Africa

3.3.1 *State level human rights regulatory responses to artificial intelligence*

There is limited literature on how states are regulating AI within Africa. The reason for the scarcity of literature on this subject goes beyond the general paucity of attention given to the area. It is also because state regulation of AI in Africa is still within the early stages of emergence.[176] When looked at closely, there is some modest evidence of states within the region regulating and/or legitimising AI through executive action (such as developing national AI strategies) or through legislative action (such as promulgating laws on AI or establishing AI agencies and commissions).

It is trite that the governance of AI by the African states with AI regulatory frameworks have relied on principles in subjects such as data protection law, telecommunication law, competition law, intellectual property law, liability law and human rights law. These African states who have established some direct or indirect regulation to the

174 Abdulrauf LA & Fombad CM 'Personal Data Protection in Nigeria: Reflections on Opportunities, Options and Challenges to Legal Reforms' at 105–134; Makulilo AB 'Data Protection Regimes in Africa: too far from the European "'adequacy" standard?' at 42–50.

175 Even though the instrumentality of the law need not 'catch up' to be able to regulate AI. There are opinions about how the regulation of AI cannot be adequate because regulators may constantly struggle to 'catch up' with the pace and knowledge with which the technology grows: see 'Technology is changing faster than regulators can keep up – here's how to close the gap'. However, in Wylie at 44, the author notes: 'For too long the congresses and parliaments of the world have fallen for a mistaken view that somehow "the law cannot keep up with technology".' The technology sector loves to parrot this idea, as it tends to make the legislators feel too stupid or out of touch to challenge their power. But the law *can* keep up with technology, just as it has with medicines, civil engineering, food standards, energy, and countless other highly technical fields. Legislators do not need to understand the chemistry of molecular isomers inside a new cancer drug to create effective drug review processes, nor do they need to know about the conductivity of copper in high voltage wiring to create effective insulation safety standards. We do not expect our legislators to have expert technical knowledge in any other sector because we devolve technical oversight responsibility to regulators. Regulation works because we trust people who know better than we do to investigate industries and innovations as the guardians of public safety.' It may be true that technological disruption moves much quicker than the law, perhaps this may be why there is a push for AI to be regulated early enough – from its design stage. The law cannot cover every eventuality. It relies on industries to develop standards and ethical codes to supplement the law and provide guidance.

176 Open AIR: '7 Ways that African States are Legitimizing Artificial Intelligence'.

use, development or deploy of AI, have done so with intent and provisions that protect human rights values. For example, Mauritius legitimised AI mostly for socio-economic benefits with special emphasis on advancing sectors such as health care, food, manufacturing, fintech, agriculture, transport, ocean economy and citizen services.[177] However, Mauritius was also clear that adoption of AI could potentially introduce privacy concerns[178] and threaten the loss of jobs,[179] among other ethical and human rights issues.[180] For Uganda, their Ministry of ICT and National Guidance set up its AI taskforce to focus on addressing local issues, including increasing agricultural production, on which the largest percentage of the country's population relies.[181] Uganda set up its taskforce to advise government on domesticating AI to fast-track the country's economic development, particularly in areas such as agriculture, healthcare, and promoting the right to education.[182] However, as mentioned earlier, Uganda has been criticised for also allowing the country's use of AI to infringe on the rights of its citizens, especially via the use of surveillance technologies obtained from China.[183] There are concerns about the use of Chinese-made facial recognition technologies in Uganda's surveillance networks, which have been criticised for their potential to facilitate human rights abuses. Critics argue that the use of these technologies could enable the government to track and monitor citizens without their knowledge or consent, and that they could be used to target marginalised or vulnerable communities.[184]

More judiciously, and beyond a regulatory response, Nigeria's desire to transform the nation by using AI for sustainable development (as well deploying the technology's power to foster innovation, national productivity, and human welfare), led the country to being the first country in the region to institutionalise a National Centre for AI and Robotics (NCAIR);[185] and the establishment of dedicated government institutions who are fostering a knowledge-based economy, and promoting the research and development of AI systems in Nigeria.[186] Like the European Union's General Data Protection

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177 MAIS at 31–63.
178 Ibid. at 16.
179 Ibid. at 17.
180 Ibid.
181 Ministry of ICT, Uganda.
182 Ibid.
183 See 'Uganda installs Huawei's AI-powered facial recognition surveillance system "nationwide"'; New report by Algorithm Watch: 'Identity-management and citizen scoring in Ghana, Rwanda, Tunisia, Uganda, Zimbabwe and China'.
184 Ibid.
185 The National Centre for Artificial Intelligence and Robotics (NCAIR) was commissioned in Abuja on 13 November 2020 as a response to the directive for all agencies under the Ministry of Communications and Digital Economy to formulate practical strategies for enhanced implementation of the digital economy. NCAIR is now a digital laboratory for advancing skills development and innovation in AI. It is a special purpose vehicle under the National Information Technology Development Agency (NITDA) to accelerate AI development in Nigeria.
186 The Ministry of Communications and Digital Economy, formerly known as Ministry of Communication Technology, was created to foster a knowledge-based economy and information society in Nigeria. The Ministry was created to facilitate ICT as a key tool in the transformation agenda for Nigeria in the areas of job creation, economic growth, and transparency of governance (Ministry of Communication Technology: <https://www.commtech.gov.ng/the-ministry/about-the-ministry.html>). The Federal Ministry of Communications

[*continued on next page*]

Regulation (GDPR),[187] Nigeria has its Nigeria Data Protection Regulation (NDPR)[188] to provide a legal framework for the use and exchange of electronic data. The Regulation seeks to capture international best practices regarding safeguarding the rights of natural persons to data privacy; fostering safe conduct of transactions involving the exchange of personal data; preventing manipulation of personal data; ensuring that Nigerian businesses remain competitive in international trade through the safeguards afforded by a just and equitable legal regulatory framework on data protection; and ensuring that the Nigerian data-protection framework is consistent with global best practices.

Robust data-privacy frameworks are important to peg some of the threats linked to the use of AI. This is because AI systems often rely on vast amounts of personal data to function effectively, and this data can be sensitive and private, such as medical records, financial information, and personal communications. Without strong data-privacy frameworks in place, there is a risk that this data can be accessed, used, or shared without the consent or knowledge of the individuals concerned, which can have serious implications for their privacy, security, and human rights. In particular, vulnerable or

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and Digital Economy, in January 2020, partnered with IBM to provide Nigerians with over 280 + hours of free learning & 85 + courses on key emerging technologies like Artificial Intelligence and Blockchain. They launched a website viz: https://www.digitalnigeria.gov.ng/ where Nigerians can register to study technology-related courses to develop the capacity of Nigerians to use AI to solve problems in Nigeria. The Ministry published its National Digital Economy Policy and Strategy 2020–2030 (NDEPS), which is based on 8 pillars for the acceleration of the Nigerian digital economy, namely: (1) Developmental regulation; (2) Digital literacy and skills; (3) Solid infrastructure; (4) Service infrastructure; (5) Digital services development and promotion; (6) Soft infrastructure; (7) Digital society and emerging technologies; and (8) Indigenous content development and adoption. AI is referred to under Pillar 7: Digital Society and Emerging Technologies, as one of the emerging technologies that the ministry will act on. The focus under this pillar is to tie the development of the digital economy using AI with indices of well-being in the lives of ordinary citizens. In this respect, the strategy document outlines policy objectives and implementation strategies.

187 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons about the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation). The GDPR was put into effect on 25 May 2018, and it addresses the transfer of personal data even outside the European Union (EU) and the European Economic Areas (EEA).

188 Developed by the Nigerian NITDA, an agency of the Federal Government responsible for implementing the Information and Communication Technology (ICT) Policies of the Federal Ministry of Communications and the Digital Economy of the Federal Republic of Nigeria. They developed the NDPR to provide a legal framework for the use and exchange of electronic data. The NDP|R was created pursuant to s 32 of the NITDA Act, 2007. The Regulation seeks to capture international best practices regarding 'Safeguarding the rights of natural persons to data privacy; Fostering safe conduct of transactions involving the exchange of personal data; Preventing manipulation of personal data; Ensuring that Nigerian businesses remain competitive in international trade through the safeguards afforded by a just and equitable legal regulatory framework on data protection; and, Ensuring that the Nigerian Data protection framework is consistent with global best practices.' The Regulation applies to all transactions that require the processing of personal data irrespective of how the data is processed or intended to be processed in respect of natural persons in Nigeria; and natural persons residing in Nigeria or residing outside Nigeria but of Nigerian descent.

marginalised groups may be disproportionately impacted by the misuse of personal data, such as discrimination, exclusion, or stigmatisation. Therefore, a robust data-privacy framework can help to address these risks by providing clear guidelines on how personal data should be collected, stored, used, and shared, as well as what safeguards should be put in place to protect individuals' privacy and security. This includes measures such as data anonymisation, informed consent, data protection impact assessments, and the right to access, correct, or delete personal data. By ensuring that personal data is collected, processed, and used in a responsible and ethical manner, robust data-privacy frameworks can help to promote the responsible use of AI and protect the human rights of individuals. This is particularly important in the context of AI, which has the potential to impact many aspects of people's lives, from employment and healthcare to law enforcement and national security.

Kenya, as a leading AI hub of Eastern Africa, passed its Data Protection Act[189] in 2019 to regulate the collection and processing of data in Kenya; it also applies to the processing of personal data by data controllers and data processors who use automated or non-automated means.[190] The Kenyan government commissioned a blockchain[191] and AI task force in 2018 to contextualise the application of AI in areas of the country's financial, cyber-security, land titling, election and single digital identity processes.[192] In the bid to advance the right to housing, the Kenya Affordable Housing Programme's Development Framework Guidelines,[193] proposed the use of AI to assess citizens' eligibility for affordable housing.[194] Even though the country is yet to directly regulate the technology, the country has introduced coding into the syllabus of primary and secondary schools to improve citizens' understanding of AI development from an early age.[195]

189 Data Protection Act No. 24 of 2019 (Republic of Kenya).

190 S 35 of the Act provides for principles and obligations on data protection from automated decision making, stating that 'every data subject has a right not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning or significantly affects [sic] the data subject.'

191 Blockchain is a decentralised, digital ledger that records transactions in a secure and transparent manner. It could be described as a digital database that stores information across a network of computers, rather than on a single central server. Each block of data in the chain contains a unique cryptographic hash, which is a mathematical function that makes it nearly impossible to alter the information stored in the block. One of the key features of blockchain technology is its decentralised nature, which means that it is not controlled by any single entity or authority. Instead, transactions on the blockchain are verified and recorded by a network of users, who collectively maintain the integrity of the ledger. Blockchain is perhaps best known as the underlying technology behind cryptocurrencies such as Bitcoin, but it has many other potential applications too.

192 Data Protection Act No. 24 of 2019 (Republic of Kenya).

193 Issued under the auspices of the Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works: See 'Housing and Urban'.

194 Through a scoring system via the Credit Reference Bureau (CRB) verification, credit assessments are driven by data analytics. This means that 'the credit and risk decision-making is fully automated' and 'the level of Artificial Intelligence integrations being deployed reduce the time taken on each assessment – providing a credit profile of each applicant in much less time than is conventionally accepted'. See Kenya Affordable Housing Programme: Development Framework Guidelines.

195 'Kenya's new curriculum to teach coding in Primary and Secondary Schools'.

In South Africa, some existing laws apply to the use of AI. For example, the Electronic Communications and Transactions Act[196] in sections 1[197] and 20[198] make provision for automated transactions which will apply to transactions made by, or with the use of, AI. Also, the Medicines and Related Substances Act[199] regulates certain medical devices that are used in the medical profession. The MRS Act was subsequently amended to expand the definition of 'medical device' to include any instrument, apparatus, machine, appliance, implant, or software etc. used for diagnosis, treatment, monitoring, or modification of human beings.[200] Ryszard Paolo Lisinski[201] says the new definition of 'medical devices' recognises the proposed use of AI in South Africa's health care.

More significantly in South Africa is the Protection of Personal Information Act.[202] This legislation was promulgated to give effect to the constitutional right to privacy by safeguarding the right to protect personal information, subject to only justifiable limitations.[203] The operational provisions of POPIA officially commenced in July 2020[204] and section 71(1), which governs automated decision-making, protects data subjects from being subjected to a decision which is based solely on automated decision-making,

196 Act No. 25 of 2002 (South Africa) (ECT Act).

197 The ECT Act defines automated transaction as 'an electronic transaction conducted or performed, in whole or in part, by means of data messages in which the conduct or data messages of one or both of the parties are not reviewed by a natural person in the ordinary course of such natural person's business or employment'.

198 'In an automated transaction (a) an agreement may be formed where an electronic agent performs an action required by law for agreement formation; (b) an agreement may be formed where all parties to a transaction or either one of them uses an electronic agent; (c) a party using an electronic agent to form an agreement is, subject to paragraph (d), presumed to be bound by the terms of that agreement irrespective of whether that person reviewed the actions of the electronic agent or the terms of the agreement; (d) a party interacting with an electronic agent to form an agreement is not bound by the terms of the agreement unless those terms were capable of being reviewed by a natural person representing that party prior to agreement formation; (e) no agreement is formed where a natural person interacts directly with the electronic agent of another person and has made a material error during the creation of a data message and– (i) the electronic agent did not provide that person with an opportunity, to prevent or correct the error: (ii) that person notifies the other person of the error as soon as practicable after that person has learned of it: (iii) that person takes reasonable steps, including steps that conform to the other person's instructions to return any performance received, or, if instructed to do so, to destroy that performance: and (iv) that person has not used or received any material benefit or value from any performance received from the other person.'

199 Act No. 101 of 1965 (South Africa) (MRS Act).

200 Medicines and Related Substances Amendment Act No. 14 of 2015 (South Africa) s 1(h).

201 Lisinski RP 'The current South African legal position on artificial intelligence: what can we learn from the United States and Europe?' at 11.

202 Act No. 4 of 2013 (South Africa) (POPIA).

203 Ibid. Preamble. These limitations are aimed at balancing the right to privacy against other rights, particularly the right of access to information, and protecting important interests, including the free flow of information within South Africa and across international borders.

204 In July 2020 all the operational provisions of POPIA, which were not operational, officially commenced, except for two provisions, ss 110 and 114(4), which is slated to commence in June 2021. These two sections deal with the amendment of laws and the transition of certain powers from the South African Human Rights Commission to the Information Regulator: Webber Wentzel: 'Artificial Intelligence has POPIA implications'.

where such a decision results in legal consequences for the data subject.[205] Also, section 57(1)(*a*) requires that a responsible party, such as an organisation implementing an AI system, obtains prior authorisation from the Information Regulator if it intends to process any unique identifiers of data subjects for a purpose other than that intended at collection, and with the aim of linking the information with information processed by other responsible parties.[206] With the use of AI, a responsible party will need to consider not only what kinds of information will be processed by an AI system, but also how the AI system will use it, to prevent a breach of the data protection requirements within POPIA. South Africa backed its ambition to adopt AI into its governance structures and human services by establishing a Presidential Commission to develop an integrated national response strategy for the adoption of AI.[207] Incidentally, South Africa's president has become the first head of state to deliver a live holographic broadcast.[208] A comprehensive regulatory framework for the use of AI is however lacking.

Kenya,[209] South Africa,[210] Uganda,[211] Mauritius,[212] and Nigeria[213] are just a few of the African countries who have established strong AI Agencies, Task Forces and Commissions, all having techno-optimistic goals and using optimistic language in describing how AI can transform or improve the socio-economic rights of citizens. Indeed, South Africa wants to be fully integrated into an economy that uses technological innovation to revolutionise industrial processes and energy provision – one that will enhance food

205 POPIA s 71(1) provides: 'Subject to subsection (2), a data subject may not be subject to a decision which results in legal consequences for him, her or it, or which affects him, her or it to a substantial degree, which is based solely on the basis of the automated processing of personal information intended to provide a profile of such person including his or her performance at work, or his, her or its credit worthiness, reliability, location, health, personal preferences or conduct.' S 71(2) provides: 'The provisions of subsection (1) do not apply if the decision– (a) has been taken in connection with the conclusion or execution of a contract, and– (i) the request of the data subject in terms of the contract has been met; or (ii) appropriate measures have been taken to protect the data subject's legitimate interests; or (b) is governed by a law or code of conduct in which appropriate measures are specified for protecting the legitimate interests of data subjects.'

206 S 57(1)(b) provides that authorisation may also be needed to process information on criminal behaviour or unlawful or objectionable conduct on behalf of third parties. And in terms of s 57(1)(c), for the purpose of credit reporting. Subsection (d) requires the same authorisation for transfer special personal information, or the personal information of children, to a third party in a foreign country that does not provide an adequate level of protection for the processing of personal information.

207 The Presidency: 'President appoints Commission on Fourth Industrial Revolution'; Gewirth A 'Human dignity as the basis of rights' at 10–28. The 'Presidential Commission on the 4IR' is tasked to identify relevant policies, strategies and action plans that will position South Africa as a competitive global player in 4IR.

208 Staff Writer 'Watch: Ramaphosa delivers speech via hologram' via-hologram.

209 'Kenya Govt unveils 11 Member Blockchain & AI Taskforce headed by Bitange Ndemo'.

210 '4IR Commission presents draft diagnostic report'.

211 'Uganda prepares to harness opportunities of 4th Industrial revolution'.

212 Republic of Mauritius: 'Artificial Intelligence can ensure a better society and promote social inclusion and safety, says PM'.

213 Shogbola O 'FG to Establish Two New Agencies'.

and water security and build smart human settlements.[214] What is more, Egypt projects that its adoption of AI will contribute almost 10% to its GDP by 2030.[215] Similarly, Botswana projects the state's AI infrastructure will move the country from an upper-middle-income country to a high-income country by 2036.[216] Senegal may be building an 'AI city', 35 kilometres from its capital.[217] The inhabitants of this city can expect to live in connected homes, use paperless transit tickets and smart parking systems, access e-health services and live next to artificial rivers, all of which is promised via the deployment of AI systems.[218] The Republic of Benin is also developing its first AI digital neighbourhood in Cotonou.[219]

These projections may be sunny ambitions to have but, without a comprehensive and legitimate framework to address the dangers and limitations of AI (especially human rights violations), these projections are blinded to the full range of ramifications of the adoption of AI on the wellbeing and rights of people on the continent. It is especially important to understand these outcomes because, as the use of AI becomes more and more omnipresent, it is compelling neoliberal globalisation through near relentless deregulation, denationalisation, and a threat to disinvest from human rights standards.[220] It is therefore pertinent for AI strategies to be legitimised legally, institutionally, and popularly, with coordination at the continental level (even while maintaining sub-regional and domestic standards). This is important for two reasons: first, to prevent AI systems from being used to perpetuate and exacerbate human rights abuses on the continent; and second, to leverage the potentials of AI to enhance human rights protection and advance developmental goals on the continent. It is also significant to be cognisant of how the digital divide affects the African continent. Many African countries lack the necessary infrastructure, such as high-speed internet and reliable power supply, which are essential for AI development and deployment. There is also a shortage of skilled professionals in AI-related fields in Africa, which makes it difficult to develop and implement AI technologies. Another factor is the lack of political and economic leverage. Several countries in the region struggle with political instability and economic challenges. And so, without political and economic leverage, it can be challenging to secure the resources and support necessary to implement AI technologies effectively. Worthy of note also is the cookie-cutter approach to the adoption of laws, policies, and regulations when it comes to AI. Countries in Africa may adopt laws and

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214 Ramaphosa C 'A national strategy for harnessing the Fourth Industrial Revolution: The case of South Africa'.

215 'Artificial Intelligence in the Spotlight'.

216 UNESCO:'Botswana instigates policy dialogue on revised STI policy in Gaborone'.

217 'Smart cities'.

218 Ibid.

219 'Five countries at the digital cutting edge in Africa'.

220 Baxi makes a distinctive revision of human rights through an analysis of several concepts: history, activism, business, modernism, identity, institutionalism, politics and suffering among others. He offers an unconventional reading of human rights through a subaltern lens by positing that the true definers of human rights are those in struggle – those in the Third World. He challenges the westernisation of human rights as a 'gift from the West to the rest' and then scrutinises the impact of the UN as well as the UDHR paradigm, which he believes will be (and is currently) replaced by what he calls a 'trade related market friendly' doctrine of 'legitimation of extraordinary imposition of human suffering' in the cause and the course of the contemporary march of global capital and industrialisation. See Baxi U *The Future of Human Rights*.

policies related to AI that are based on models from other countries or regions, without considering the unique context and needs of their own countries. This can lead to regulations that are not well-suited to the African context, which can hinder the protection or recognition of human rights. To overcome these challenges, it is important to develop legitimate frameworks that are tailored to the African context, and to invest in the necessary infrastructure and skills development to support the development and deployment of AI technologies that will advance human rights.

3.3.2 *Artificial intelligence and the African Commission on Human and Peoples Rights*

Established within the Organisation of African Unity in 1963 (now African Union (AU)),[221] the ACHPR is officially charged with three major functions:[222] the protection of human and peoples' rights; the promotion of human and peoples' rights; and the interpretation of the ACHPR.[223] With respect to the Commission's human rights mandate, it has recognised that emerging technologies such as AI, robots, autonomous systems, and others bring both opportunities and risks for promoting and protecting human rights in Africa.[224] The Commission has highlighted the need for sufficient consideration of African norms, values, and ethos in the framing of global AI governance frameworks. By emphasising the need for a comprehensive application of trustworthy AI and responsible AI principles,[225] the Commission welcomes the development and use of the technology subject to the ways that it benefits African states and Africans and, more importantly, how it will preserve and promote various rights under the African Charter such as the right to life, dignity, equality and non-discrimination, freedom of assembly, freedom of expression and more.

Continentally, the AU Digital Strategy Information for Africa (2020–2030) has proposed an African Peer Review Mechanism as part of a continent-wide digital governance on the use of AI within Member States.[226] The AU has prescribed some rules on AI on the grounds of solidarity and cooperation to ensure that Africa's forthcoming digital infrastructure with AI is cooperative, transformative, inclusive, home-grown, safe and is able to allow Member States to have varied levels of what they call 'Digital Maturity'.[227]

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221 AU 'About the African Union: History'.

222 In addition to performing any other tasks which may be entrusted to it by the Assembly of Heads of State and Government.

223 African Charter on Human and Peoples' Rights (ACHPR) adopted on 27 June 1981, entered into force on 21 October 1986; AU Doc CAB/LEG/67/3/Rev 5. For these and other OAU/AU human rights instruments, see Heyns C & Killander M (eds) *Compendium of Key Human Rights Documents of the African Union*. See also the official repository of the AU's website www.au.int. The Constitutive Act of the African Union and the Protocol on Amendments to the Constitutive Act of the African Union lay out the aims of the AU.

224 ACHPR '473 Resolution on the need to undertake a Study on human and peoples' rights and artificial intelligence (AI), robotics and other new and emerging technologies in Africa'.

225 Ibid.

226 AU: 'The Digital Transformation Strategy for Africa (2020-2030)'.

227 Ibid. This Digital Maturity Model is where Member States can identify their current digital state (as is), and where they want to go (to be) along a development continuum; a set of flexible 'pathways to prosperity' that brings together the various foundational pillars in different configurations. This is to provide Member States with a range of options and

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This prescription for an African solidarity in the use of AI is also required for the equitable sharing of responsibility of the technology and its impact on the continent. In 2019, a constituted AU Working Group on AI met in Cairo to discuss the crafting of an African strategy for AI and to reach a unified African position on AI.[228] The AI Working Group proposed the need for an African AI observatory that will monitor the ethical and social implications of AI development on the continent and provide data and insights to policymakers. They also proposed the launch of an African AI readiness indicator to measure the preparedness of African countries to adopt and successfully implement AI technologies.[229]

Progressively (and counter to a 'cookie-cutter' approach to AI regulation), in February 2021 the ACHPR adopted a resolution on human rights and AI.[230] The resolution emphasises the need for sufficient consideration of African norms, ethics, values and communitarian ethos, in the development of AI structures, and it also emphasises the need for freedom from domination of one people by another in framing of global AI governance frameworks.[231] The Commission calls on African States to ensure that the development and use of AI is compatible with the rights and duties in the ACHPR to uphold 'human dignity, privacy, equality, non-discrimination, inclusion, diversity, safety, fairness, transparency, accountability and economic development'[232] and that all AI technologies that are imported from other continents are made applicable to the African context and or adjusted to fit the continent's needs, ensuring that AI technologies with far reaching consequences for humans are codified with human rights principles, and remain under meaningful human control.[233] The Commission is mindful that the use of AI may produce different outcomes in Africa than it will in other regions and so it established the need to undertake a study on the intersection of human and peoples' rights and AI in Africa. Experts' consultation on the implementation of the referenced Resolution also took off.[234]

Within the various instruments of IHRL, the ACHPR would be more apposite for Africans to rely on, not just in terms of jurisdictional and normative applicability to the region, but because there's a peculiar Africanist approach to human rights protection that the governance of AI can draw from.[235] Compared to the other human rights

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alternatives to consider in pursuing digital transformation, in a way that is best suited to their needs.

228 One Trust Data Guidance: 'African Bodies: AU AI Working Group holds first session'.

229 Ibid.

230 ACHPR/Res. 473 (EXT.OS/ XXXI) 2021.

231 Ibid.

232 Ibid.

233 Ibid.

234 On Wednesday, 30 March 2022, Commissioner Solomon Ayele Dersso, who sponsored and serves as the Focal Point for ACHPR Resolution 473, inaugurated an experts' consultation on the implementation of the Resolution. the objectives of the consultation are for the Focal Point to engage with a selected group of experts on the following: Discussing the nature and content of the assignment that the Resolution laid down; reviewing or agreeing on the roadmap for the development of the Study; agreeing on distribution of tasks/roles and next steps for the development of Study; and identifying promotional activities on the work assigned under the Resolution.

235 In what distinguishes the African Charter from other international human rights instruments like the ECHR and the American Convention on Human Rights (ACHR), the ACHPR

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instruments, the African Charter is commonly deemed 'autochthonous'[236] in that it uniquely includes the concept of 'peoples' in its human rights protection,[237] it refers to individual duties (not just the duties of the state),[238] and makes no distinction in the implementation of all categories of rights. It also takes an anti-colonial stand.[239] The predicted impact of the use, deployment and development of AI systems must consider the rights of collectives, peoples, communities and not individuals. This speaks to the African concern for a communal kind of worldview – a communitarianist perspective, as opposed to an atomistic individual concern for wellbeing.[240] The ACHPR and its related protocols and conventions, including the AU Convention on Cyber security and Personal Data Protection[241] (though not without their limitations[242]) should serve as foundational rules that should guide the ethical governance of AI on the continent.

Compared to the EU's AI Act[243] which sets out horizontal rules for the development, commodification and use of AI-driven products, services, and systems within the territory of the EU, there is no continental legal framework for the regulation of AI in Africa.[244] This lacuna could mean that there is neither a specific African requirement for the market entrance of AI technologies nor a safety and conformity regime that is applicable to machine learning training, testing and validation of datasets across Africa. Therefore, foreign companies may not be obliged to conform to regional-based norms like the ACHPR or the Malabo Convention as they will focus on meeting only domestic

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does not contain a general derogation clause entitling Member States to suspend their human rights obligations as in the European or Inter-American context.

236 Viljoen F 'From a cat into a lion? An overview of the progress and challenges of the African human right system at the African Commission's 25-year mark' at 298–316.

237 See, e.g., ACHPR arts 20–24.

238 The African Charter departs from the premise that rights and duties inevitably exist concomitantly. The Preamble of the Charter draws the inference that 'the enjoyment of rights and freedoms also implies the performance of duties'. A list of duties is provided in art. 29, each implicitly embodying the 'values of African civilization'. The principle that rights and duties are reciprocal, forms the basis of art. 27(2), which states that rights must be 'exercised with due regard to the rights of others, collective security, morality and common interest'.

239 Ibid. See also the ACHPR Preamble.

240 *Katangese Peoples' Congress v Zaire* (2000) and *Gunme and Others v Cameroon* (2009).

241 Popularly called the Malabo Convention.

242 On the limitations of the ACHPR see Lindholt L *Questioning the universality of human rights: The African charter on human and peoples' rights in Botswana, Malawi and Mozambique*; Murray R *The African Charter on Human and Peoples' Rights: A Commentary*; Ssenyonjo M 'Responding to human rights violations in Africa: Assessing the role of the African Commission and Court on Human and Peoples' Rights (1987–2018)' at 1–42. On the limitations of the Malabo Convention see Orji UJ 'The African Union Convention on Cyber security: A Regional Response Towards Cyber Stability?' at 91–129; Sutherland E 'Digital privacy in Africa: cyber security, data protection & surveillance'; Coleman D 'Digital colonialism: The 21st century scramble for Africa through the extraction and control of user data and the limitations of data protection laws' at 417.

243 EC: 'Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonized Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts'.

244 As at the time of writing this chapter.

requirements, if any.[245] And because the use of AI 'dissolves borders' and demands action in borderless areas, national laws are sometimes insufficient to regulate such a borderless technology.

But is an African regional framework on AI crucial for the governance of AI? First, such a legal regime could be faced with issues of AU bureaucracy,[246] fragmentation, and regulatory dissonance (due to the continent's vast heterogeneousness and considering that African systems are at varying stages of the legitimisation and use of AI). Second, such continental framework may be too much of a one-size-fits-all which may not be holistic for the governance of AI across the sub-regions in Africa, or even across sectors (for example, the ethical rules for medical AI may need to differ from rules that govern the use of AI in fintech). Third (and perhaps the strongest argument against the imperativeness of continental legal regime for AI technologies), the intergovernmental nature of the Union, as well as limitations posed by national sovereignty, non-intervention, and the AU principle of subsidiarity,[247] could make such a legal regime 'soft' and without teeth (among other constraints).[248] Fourth and finally, there may be some concern that creating horizontal rules on AI may be too hurried for Africa now, therefore it may be pertinent to wait and learn from the mistakes of other regional frameworks (where necessary); or, to wait for some reasonable level of preparedness for the deployment of the technology in the region (since several African countries are yet to enter the 4IR as claimed). Contrary to this last point however, to stay a regional legal regime on AI for such reasons may be unfavourable to ensuring that from the onset, AI systems comply with the legal and human rights standards prescribed in the African Charter. Rulemaking

245 This may allow some companies to cherry pick countries within Africa where they can exploit opportunities to thwart or avoid ethical, legal, and human rights obligations. Also, a transnational company dealing with an array of domestic legal requirements may find it impeding on their business model or complicating the software installation and functionality for these autonomous vehicles to meet the different national standards.

246 Tieku TK 'The African Union: Successes and Failures'; Tieku TK 'Punching above Weight: How the African Union Commission Exercises Agency in Politics' at 254–273.

247 Subsidiarity has been long recognised as a principle for organising divisions of labour. Simply put, it is the norm that a central authority should have a subsidiary function in carrying out only those tasks that cannot be done effectively at a more immediate or local level. As a principle, subsidiarity assists in determining ways to organise the division of labour in overlapping or asymmetric hierarchies. In the African context, subsidiarity as a principle involves three different levels of actors: between the UN and the AU, between the AU and various Regional Economic Communities (RECs); and to a lesser extent the UN and the RECs directly. E.g., the AU should only become involved in an issue when the lower level cannot effectively resolve a particular issue. The principle of subsidiarity has been described by Petzold as being 'generally understood to mean that in a community of societal "pluralism", the larger social unit should assume responsibility for functions only in so far as the smaller social unit is unable to do so.' See Petzold H *The convention and the principle of subsidiarity*. The principle provides an analytically descriptive way to make sense of a variety of disparate features of the existing structure of IHRL, from the interpretive discretion accorded to states, to the relationship of regional and universal systems, while also justifying the necessity of international cooperation, assistance, and intervention. See Carozza PG 'Subsidiarity as a structural principle of international human rights law' at 38–79.

248 Such as striving to obtain the goodwill of member states, and the lack of consistent implementation of the AU's legal and policy provisions. See 'The reality of the AU's response to crises'; 'The African Charter on Human and Peoples' Rights: how effective is this legal instrument in shaping a continental human rights culture in Africa?'

on AI may need to be proactive because unlike other technologies, AI is quite too critical to be governed with a reactive or hands-off fashion.

Nevertheless, a specific African human rights framework for AI can enrich the ways that stakeholders in this field should think about AI norms in Africa. There is also a chance to consider Africanist values (like full transparency, cultural sensitivity, shared decision-making, and communal ownership of codes etc.) into the use and development of AI. Beyond just aligning with other international regimes or following the trend of tech-solutionist language (or innovation for the sake of it), the continent can design for itself a more critical, layered, and risk-based approach to trustworthy and rights-respecting AI systems that are most significant to African peoples and communities.

In the bid to finally develop a continental legal framework on AI, the AU High-Level Panel on Emerging Technologies (APET, a body appointed by the AU to provide guidance on emerging technologies that are expected to have a significant impact on Africa's social and economic development),[249] organised an experts consultative meeting in 2022 in Dakar on developing Africa's continental strategy for AI in Africa.[250] Among other objectives, this continental AI strategy for Africa is to help establish continental, regional, and national systems on AI that will be responsible for building AI infrastructures and reviewing policy implementation frameworks governing AI. Interestingly, it is also proposed to promote the consumption and utilisation of locally generated African AI products instead of the continued reliance on imported AI products.[251] However, it is set to ensure a conducive environment for 'market-based AI policies' across the continent and to allow for compliance with regulatory processes which must improve data transparency, data sharing, and collaboration in 'AI-related economic activities'.[252]

With the above strategy in view, there now exists a tension between a human-rights centric approach to Africa's continental AI regime (initiated by the ACHPR through resolution 473 to ensure compatibility with the ACHPR), and an economics-centric approach to Africa's continental AI regime (initiated by the AU Development Agency (AUDA) and New Partnership for Africa's Development NEPAD[253] to ensure realisation

249 The APET was established in 2017 to advise the AU Commission and Member States on how best to leverage emerging technologies for sustainable development in Africa. The panel consists of 10 experts from across Africa and the diaspora, with a wide range of expertise in areas such as artificial intelligence, biotechnology, nanotechnology, and space technology. The APET is responsible for conducting research and providing advice on a range of issues related to emerging technologies, including policy and regulatory frameworks, technology assessments, capacity building, regulation, and international cooperation. See African Union High Level Panel on Emerging Technologies (APET).

250 AUDA-NEPAD: 'The African Union Artificial Intelligence Continental Strategy For Africa'.

251 Ibid.

252 Ibid.

253 The agency was created by merging two institutions: the AUDA, which was established in 2017, and the NEPAD) which was launched in 2001. By bringing together these two institutions, AUDA-NEPAD aims to enhance the implementation of development programs and projects in Africa, as well as to provide technical assistance and capacity-building support to African countries. It is a technical agency of the AU, created in 2018, that seeks to drive the implementation of key development priorities for Africa, with a focus on promoting regional integration and economic development. See AUDA-NEPAD <https://www.nepad.org/who-we-are>.

of Agenda 2063[254]). While there are some obvious commonalities in the objective of both approaches, they largely differ in approach. The former could ensure that the development and use of AI systems in Africa are aligned with recognised shared human rights standards and prioritises the protection of people's rights over economic considerations. The latter, however, may seek to promote the governance of AI in a way that prioritises the economic benefits that can be derived from AI development and use in Africa (for example, increased productivity and efficiency in manufacturing, mining, finance etc.). Economic prioritisation over individual rights and freedoms may place less emphasis on standards of accountability and transparency. Such economic approach may rely on market forces to guide the direction of Africa's AI. These market forces may not adequately address the negative impacts of AI on individuals, such as job displacement, discrimination, and privacy violations. This is why it is argued that the 4IR is compelling neoliberal globalisation through near relentless deregulation, denationalisation, and a threat to disinvest from human rights standards.[255]

Agreed, AI regulation cannot be discussed outside the scope of the economic and market paradigms surrounding the technology.[256] This is because most AI systems are commercial in nature and so there are liberalist paradigms that maintain that regulating AI can be overlaid on industry-specific actors and their parameters.[257] But the Baxian lens could be used to challenge this notion from a human rights-centric perspective.[258] Baxi argues that the trade-related market-friendly human rights paradigm is supplanting the UDHR and insists on promoting and protecting the collective rights of various formations of global capital mostly at the direct expense of human beings and communities.[259] Therefore, if industry-specific actors and their parameters are considered in the legal framework on AI for the African continent, they could be advancing the formations (and growth) of global capital at the expense of human rights which are originally designed for the attainment of dignity and wellbeing of human beings especially the 'wellbeing of socially, economically and civilisationally vulnerable peoples and communities.'[260] There are also other ways that industry (or capitalist) actors and modes for governing AI could be conflicting with human rights goals by producing oversurveillance, targeting, stereotyping, bias and exclusion.[261] Therefore extensive investigations of current legal reasoning could be less profitable approaches for Africa.[262] Instead, the continent could perhaps benefit from the formation of a more elaborated and critical philosophy that is of a true interdisciplinary nature.

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254 Africa's blueprint and economic master plan for transforming Africa into the global powerhouse of the future. AU: 'Agenda 2063: The Africa We Want'.

255 See Baxi.

256 Especially on issues surrounding trade, labour and antitrust (and consequences of AI in terms of employment, inequality, and competition). See Agrawal A, Gans J & Goldfarb A 'Economic policy for artificial intelligence' at 139–159; Agrawal A, Gans J & Goldfarb A *The economics of artificial intelligence: an agenda*.

257 Kerrigan C *Artificial Intelligence: Law and Regulation* (ch. 6: 'Regulatory Compliance' by Lim HY-F) at 85–107.

258 Baxi.

259 Ibid. at 132.

260 Ibid.

261 Katyal SK 'Private accountability in the age of artificial intelligence' at 54; Gabriel I 'Artificial intelligence, values, and alignment' at 411–437; Risse at 1.

262 Wahlgren P 'A general theory of artificial intelligence and law' (1984) 94 *Legal knowledge-based systems JURIX* at 79–83.

3.4 Conclusion: *Quo vadis*

Human rights laws are essential for the governance of AI. The use, development and deployment of AI in Africa can benefit from a reliance on democratic and human rights values, especially if AI systems can be structured by standards of algorithmic accountability, data protection, explainability of decision-making, and compliance with the norms of the African Charter where possible. Human rights law, despite its several critiques and limitations can serve as foundation to promote standards of equality, inclusion, diversity, safety, fairness, transparency, and algorithmic accountability when applied effectively to the use, development, and deployment of AI. It is important for these values to be recognised in law because of the potential risks and already accounted ways that AI systems have led to the disproportionate disenfranchisement of many Africans, thereby impeding their enjoyment of certain human rights.

More so, the dominant narratives around new technologies hardly reflect African perspectives, and so with the use of AI, legal systems in Africa need to consider African norms, values, and ethos in the framing of AI governance frameworks. By emphasising the need for a comprehensive application of trustworthy AI and responsible AI principles,[263] the use of the technology should be subject to the ways that it benefits African states and Africans, and more importantly, how it will preserve and promote various rights under the African Charter such as the right to life, dignity, equality and non-discrimination, freedom of assembly, freedom of expression and more.

The sudden resort to AI and other digital technologies without adequate legal governance or human rights protection can create new vulnerabilities such as the potential for the data of Africans to be commercialised and even weaponised. Therefore, issues of algorithmic bias, loss of privacy, lack of transparency, and the overall complexity in getting Africans to understand how they are interacting with AI, require legal considerations. While domestic laws in Africa are yet to fully grapple with the governance of the technology, several states are instituting legal frameworks and applying human rights principles to the governance of the technology. This modest evidence of human rights centric governance structures is commendable, but they are still far from having regulatory teeth or from comprehensively regulating the technology to protect human rights. This is partly because of the nature of AI, but also because African states are still grappling with structural, technological, and developmental setbacks, leading the region to be susceptible to technological imperialism and data colonialism (among other factors).

Promisingly, some extant data and technology governance frameworks in various states apply to the use of AI as well, and several African states are developing rights-centric laws, policies and strategies on the use, development, and deployment of AI. Data-protection laws within the continent need to be robust, amplified and enforced to cover the ethical use of AI. And because governments are mostly the largest data processor, African states may also need to establish independent data ombudsmen. (The Data Protection Bill at the Nigerian National Assembly proposes the establishment of a Data Protection Commission with enforceable powers, and a code of practice that

263 Some examples are UNESCO AI Recommendation (2021); G20 AI Guidelines (2019); OECD AI Principles (2019); and Universal Guidelines for AI (2018).

ensures a rights-respecting data governance framework for Nigeria.[264] Although the Bill is not exhaustive, this is a step in the right direction that can be initiated in other African states.)

On a continental level, The AU has prescribed AI rules on the grounds of solidarity and cooperation to ensure that Africa's forthcoming digital infrastructure with AI is cooperative, transformative, inclusive, home-grown, safe and is able to allow Member States to have varied levels of digital maturity. The ACHPR adopted a resolution on human rights and AI emphasising the need for sufficient consideration of African norms, ethics, values, and communitarian ethos, in the development of AI structures, and emphasising the need for freedom from domination of one people by another in framing of global AI governance frameworks. The Commission calls on African states to ensure that the development and use of AI is compatible with the rights and duties in the ACHPR to uphold 'human dignity, privacy, equality, non-discrimination, inclusion, diversity, safety, fairness, transparency, accountability, and economic development'.

Across Africa, the use of AI needs to be less capitalistic and more human rights-driven to meet local needs and demands. For example, the dominant discourse on the application of AI in Africa's FinTech sector,[265] and the proposed futuristic introduction of self-driving cars to Africa's transportation industry,[266] are laudable, but there is a need to consider more relevant human rights issues on the continent. How can AI be applied to help address (and not perpetuate) issues such as the indiscriminate and targeted attacks on civilians and human rights defenders, communal violence and forced evictions, hyper surveillance, and breach of privacy rights? For Africa, how can AI help in advancing the realisation of the right to adequate health care, access to education, right to food, protection of labour standards, preservation of traditional knowledge, and other pro-poor demands? The African continent is uniquely in the First, Second, Third and Fourth Industrial Revolution all at the same time, and this complexity needs to be considered if AI is intended to serve the interests of Africans.

3.5 References

'4IR Commission presents draft diagnostic report' *SAnews* (8 November 2019) <https://www.sanews.gov.za/south-africa/4ir-commission-presents-draft-diagnostic-report> (accessed 14 March 2023).

Aayog NITI 'National Strategy for Artificial Intelligence #AIForAll' (Discussion Paper, June 2018).

Abdulrauf LA & Fombad CM 'Personal Data Protection in Nigeria: Reflections on Opportunities, Options and Challenges to Legal Reforms' (2017) 38:2 *Liverpool Law Review* 105–134.

264 Data Protection Bill, 2020 (Nigeria). (A Bill for an Act to establish the Data Protection Commission charged with the responsibility for the protection of personal data, rights of data subjects, regulation of the processing of personal data and for related matters) <https://www.ncc.gov.ng/documents/911-data-protection-bill-draft-2020/file>.

265 Koffi HWS 'The Fintech Revolution: An Opportunity for the West African Financial Sector' at 771–782; Maino R et al. *FinTech in Sub-Saharan African Countries: A Game Changer?*

266 'Self-driving cars in Africa'; 'What is the future of driverless cars in Sub Saharan Africa?'; Staff Writer: 'South Africa has plans for self-driving cars – but the law needs to change first'.

Abe O and Eurallyah AJ ‘Regulating Artificial Intelligence through a human rights-based approach in Africa’ <https://pure.hud.ac.uk/ws/files/40536399/AJLS_1495_R1.pdf>.

ACHPR: ‘473 Resolution on the need to undertake a Study on human and peoples’ rights and artificial intelligence (AI), robotics and other new and emerging technologies in Africa’ ACHPR/Res. 473 (EXT.OS/ XXXI) (2021) <https://www.achpr.org/sessions/resolutions ?id=504> (accessed 14 March 2023).

‘The African Charter on Human and Peoples’ Rights: how effective is this legal instrument in shaping a continental human rights culture in Africa?’ *Le petit juriste* (21 December 2014) <https://www.lepetitjuriste.fr/the-african-charter-on-human-and-peoples-rights-how-effective-is-this-legal-instrument-in-shaping-a-continental-human-rights-culture-in-africa/> (accessed 14 March 2023).

‘African Union High Level Panel on Emerging Technologies (APET)’ <https://www.nepad. org/microsite/african-union-high-level-panel-emerging-technologies-apet> (accessed 14 March 2023).

Agbor SA AU: <https://au.int/en/speeches/20190810/remarks-he-professor-sarah-anyang-agbor-auc-commissioner-hrst-ticad-vii-session> (accessed 14 March 2023).

Agrawal A, Gans J & Goldfarb A ‘Economic policy for artificial intelligence’ (2019) 19:1 *Innovation policy and the economy* (University of Chicago Press, 2019) 139–159.

Agrawal A, Gans J & Goldfarb A *The economics of artificial intelligence: an agenda* (University of Chicago Press, 2019).

‘AI & Global Governance: AI in Africa is a Double-Edged Sword’ (UN University Centre for Policy Research) <https://cpr.unu.edu/ai-in-africa-is-a-double-edged-sword.html> (accessed 14 March 2023).

‘AI is An Ideology, Not A Technology’ *Wired* <https://www.wired.com/story/opinion-ai-is-an-ideology-not-a-technology/> (accessed 14 March 2023).

‘AI is sending people to jail – and getting it wrong’ *MIT Technology Review* <https://www.technologyreview.com/2019/01/21/137783/algorithms-criminal-justice-ai/> (accessed 14 March 2023).

‘AI programs exhibit racial and gender biases, research reveals’ *The Guardian* (13 April 2017) <http://www.theguardian.com/technology/2017/apr/13/ai-programs-exhibit-racist-and-sexist-biases-research-reveals> (accessed 14 March 2023).

Allen GC *Understanding China’s AI Strategy: Clues to Chinese Strategic Thinking on Artificial Intelligence and National Security* (Center for a New American Security Washington, DC, 2019).

Allen JF ‘AI Growing Up: The Changes and Opportunities’ *AI Magazine* (1998) 19(4) 13–23.

Alston P ‘A third generation of solidarity rights: progressive development or obfuscation of international human rights law?’ *Netherlands International Law Review* 29.3 (1982) 307–322.

‘Artificial Intelligence: The urgency for Africa’ *TechCabal* (20 February 2020) <https://techcabal.com/2020/02/20/artificial-intelligence-africa/> (accessed 14 March 2023).

‘Artificial Intelligence in the Spotlight’ *EgyptToday* <http://www.egypttoday.com/Article/ 3/81560/Artificial-Intelligence-in-the-Spotlight> (accessed 14 March 2023).

‘Artificial intelligence to revolutionise health in lower-income countries’ *The New Times – Rwanda* (11 September 2020) <https://www.newtimes.co.rw/news/artificial-intelligence-revolutionise-health-lower-income-countries> (accessed 14 March 2023).

AU 'About the African Union: History' <https://au.int/en/overview> (accessed 14 March 2023).

AU: 'Agenda 2063: The Africa We Want' <https://au.int/en/agenda2063/overview> (accessed 14 March 2023).

AU: 'The Digital Transformation Strategy for Africa (2020–2030)' <https://au.int/en/documents/ 20200518/digital-transformation-strategy-africa-2020-2030> (accessed 14 March 2023).

AUDA-NEPAD <https://www.nepad.org/who-we-are> (accessed 14 March 2023).

AUDA-NEPAD: 'The African Union Artificial Intelligence Continental Strategy For Africa' (30 May 2022) <https://www.nepad.org/news/african-union-artificial-intelligence-continental-strategy-africa> (accessed 14 March 2023).

Barfield W & Pagallo U *Research Handbook on the Law of Artificial Intelligence* (Edward Elgar Publishing, 2018).

Baxi U *The Future of Human Rights* (Oxford University Press, 2007).

Beitz CR *The idea of human rights* (Oxford University Press, 2011).

Bhatnagar S, Alexandrova A, Avin S, Cave S, Cheke L, Crosby M, Feyereisl J, Halina M, Loe BS Héigeartaigh SO, Martnez-Plumed F, Price H, Shevlin H, Weller A, Winfield A and Hernández-Orallo J 'Mapping Intelligence: Requirements and Possibilities' in Müller VC (ed.) *Philosophy and Theory of Artificial Intelligence 2017*.

Birhane A 'Algorithmic Colonization of Africa' (2020) 17:2 *SCRIPTed* 389 <https://script-ed.org/?p=3888> DOI: 10.2966/scrip.170220.389 (accessed 14 March 2023).

Bostrom N *Superintelligence: Paths, Dangers, Strategies* (Oxford: Oxford University Press, 2014).

Brachman RJ (AA) 'AI – More than the sum of its parts' (2005) AAAI Presidential Address *AI Magazine* (2006) 27(4) 19–34.

Buolamwini J & Gebru T 'Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification' Paper presented at the Conference on Fairness, Accountability, and Transparency in February 2018.

Burt C 'Implementation of CloudWalk facial recognition technology in Zimbabwe progressing in stages' *Biometric Update* (18 May 2018) <https://www.biometricupdate.com/201805/ implementation-of-cloudwalk-facial-recognition-technology-in-zimbabwe-progressing-in-stages> (accessed 14 March 2023).

Carnap R *Logical Foundations of Probability* (Chicago: The University of Chicago Press, 1962).

Carozza PG 'Subsidiarity as a structural principle of international human rights law' *American Journal of International Law* (2003) *97*(1) 38–79.

Cediey E and Foroni F 'Discrimination in access to employment on grounds of foreign origin in France' A national survey of discrimination based on the testing methodology of the International Labour Office, Geneva.

Chander A 'The Racist Algorithm?' 115 *Michigan Law Review* 1023 (2017) <https://repository.law. umich.edu/mlr/vol115/iss6/13>.

'China Is Exporting Its Digital Surveillance Methods to African Governments' *Nextgov.com* <https://www.nextgov.com/emerging-tech/2018/11/china-exporting-its-digital-surveillance -methods-african-governments/152495/>.

Choplin D 'AI Will Change Everything' in Barfield W & Pagallo U *Research Handbook on the Law of Artificial Intelligence*.

Cobbah JAM 'African values and the human rights debate: An African perspective' *Human Rights Quarterly* 9 (1987) 309.

Coleman D 'Digital colonialism: The 21st century scramble for Africa through the extraction and control of user data and the limitations of data protection laws' *Michigan Journal of. Race & Law* 24 (2018) 417.

Commons, Knowledge. "Digital colonialism and the Internet as a tool of cultural hegemony." (2014).

Cormen TH et al. *Introduction to Algorithms* 3rd edn (MIT Press, 2009).

Cui Y *Artificial Intelligence and Judicial Modernization* (Singapore: Springer Singapore Pte Limited, 2019).

The Danish Government, Ministry of Finance and Ministry of Industry, Business and Financial Affairs: 'National Strategy for Artificial Intelligence' (March 2019) <https://eng.em. dk/media/13081/305755-gb-version_4k.pdf> (accessed 14 March 2023).

DAT263x Courseware 'What is Artificial Intelligence? Course Introduction' (edX) <https://courses.edx.org> (accessed 14 March 2023).

Dembour MB 'What are human rights-four schools of thought' (2010) 32 *Human Rights Quarterly* 1.

Dolinger J 'The Failure of the Universal Declaration of Human Rights' 47 *University of Miami Inter-American Law Review* 164 <http://repository.law.miami.edu/umialr/vol47/iss2/4>.

Donnelly J 'Cultural relativism and universal human rights' *Human Rights Quarterly* 6 (1984) 400.

Donoho DL 'Relativism versus universalism in human rights: The search for meaningful standards' *Stanford Journal for International Law* 27 (1990) 345.

EC: 'Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonized Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts' (Brussels, 21 April 2021) COM (2021) 206 final, 2021/0106 (COD) <https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-laying-down-harmonised-rules-artificial-intelligence> (accessed 14 March 2023).

EC HLEG on AI: 'Shaping Europe's digital future' (14 June 2018) <https://ec.europa.eu/digital-single-market/en/high-level-expert-group-artificial-intelligence>.

'Elephants Under Attack Have An Unlikely Ally: Artificial Intelligence' *NPR.org* <https://www.npr.org/2019/10/25/760487476/elephants-under-attack-have-an-unlikely-ally-artificial-intelligence> (accessed 14 March 2023).

EY & Microsoft: 'Artificial Intelligence in Middle East and Africa: Outlook for 2019 and Beyond' How 112 Major Companies Benefit from AI <https://info.microsoft.com/rs/157-GQE-382/images/report-SRGCM1065.pdf> (Report Commissioned by Microsoft and Conducted by EY, 2018) (accessed 14 March 2023).

The Federal Government of Germany 'Nationale Strategie für Künstliche Intelligenz *AI Made in Germany*: Artificial Intelligence Strategy' (November 2018).

'Five countries at the digital cutting edge in Africa' *The Agility Effect* <https://www.theagilityeffect.com/en/case/five-urban-hubs-at-the-heart-of-africas-digital-transformation/> (accessed 14 March 2023).

Freeman M *Human rights* (John Wiley & Sons, 2017).

'The future of AI research is in Africa' *MIT Technology Review* <https://www. technologyreview.com/2019/06/21/134820/ai-africa-machine-learning-ibm-google/> (accessed 14 March 2023).

Gabriel I 'Artificial intelligence, values, and alignment' (2020) 30:3 *Minds and machines* 411–437.

Gewirth A 'Human dignity as the basis of rights' *The constitution of rights: Human dignity and American values* (1992) 10–28.

Gillespie T 'The Relevance of Algorithms' in Gillespie T, Boczkowski PJ and Foot KA (eds) *Media Technologies: Essays on Communication, Materiality, and Society*.

Gillespie T, Boczkowski PJ and Foot KA (eds) *Media Technologies: Essays on Communication, Materiality, and Society* (MIT Press, 2014).

Goodhart ME (ed.) *Human rights: politics and practice* (Oxford University Press, 2016).

'Government AI Readiness Index 2019' *Oxford Insights* <https://www.oxfordinsights.com/ai-readiness2019> (accessed 14 March 2023).

Gravett W 'Digital neo-colonialism: The Chinese model of internet sovereignty in Africa' (2020) 20:1 *African Human Rights Law Journal* 125–146 (accessed 14 March 2023).

Griffin J *Griffin On Human Rights* (2008).

Hacker P 'Teaching fairness to artificial intelligence: Existing and novel strategies against algorithmic discrimination under EU law' *Common Market Law Review* 55.4 (2018).

Hafner-Burton EM, Tsutsui K & Meyer JW 'International Human Rights Law and the Politics of Legitimation: Repressive States and Human Rights Treaties' (2008) 23:1 *International Sociology* 115–141 <https://doi.org/10.1177/0268580907084388> (accessed 14 March 2023).

Hearst MA and Hirsh H 'AI's Greatest Trends and Controversies' *IEEE Intelligent Systems* (2000) 8–17.

Heyns C & Killander M (eds) *Compendium of Key Human Rights Documents of the African Union* (2010).

Hildt E 'Artificial Intelligence: Does Consciousness Matter?' (2019) 10 *Frontiers in psychology* 1535.

HLEG: 'Ethics Guidelines for Trustworthy Artificial Intelligence' <https://ec.europa.eu/futurium/ en/ai-alliance-consultation>.

'Home' <https://www.saypeace.ng/> *SayPeace NG* (accessed 14 March 2023).

'Housing and Urban' *Housing and Urban* <https://housingandurban.go.ke/> (accessed 14 March 2023).

'How Delivery Drones Are Saving Lives in Rwanda' *Fortune* <https://fortune.com/2019/01/07/delivery-drones-rwanda/> (accessed 14 March 2023).

'How IBM Watson Is Revolutionizing Cancer Research' <http://www.healthtechzone.com/topics/ healthcare/articles/2018/08/14/439124-how-ibm-watson-revolutionizing-cancer-research.htm> (accessed 14 March 2023).

Ibhawoh B 'Cultural Relativism and Human Rights: Reconsidering the Africanist Discourse' *Netherlands Quarterly of Human Rights* 19.1 (2001) 43–62.

'Identity-management and citizen scoring in Ghana, Rwanda, Tunisia, Uganda, Zimbabwe and China' *Algorithm Watch* <https://algorithmwatch.org/en/publication/identity-management-and-citizen-scoring-in-ghana-rwanda-tunisia-uganda-zimbabwe-and-china/>.

Ignatieff M *Human rights as politics and idolatry* Vol. 39 (Princeton University Press, 2003).

IJRC: 'African Commission Bows to Political Pressure, Withdraws NGO's Observer Status' *International Justice Resource Center* (28 August 2018) <https://ijrcenter.org/2018/08/28/achpr-strips-the-coalition-of-african-lesbians-of-its-observer-status/> (accessed 14 March 2023).

'Investigation: How Governors Dickson, Okowa spend billions on high tech spying on opponents, others' *Premium Times Nigeria* (9 June 2016) <https://www.premium timesng.com/ investigationspecial-reports/204987-investigation-governors-dickson-okowa-spend-billions-high-tech-spying-opponents-others.html> (accessed 14 March 2023).

Irwin R 'Decolonising technological futures: a dialogical tryptich between Te Haumoana White, Ruth Irwin, and Tegmark's artificial intelligence' (2019) 112 *Futures* 102431.

Johnson K, Pasquale F & Chapman J 'Artificial intelligence, machine learning, and bias in finance: toward responsible innovation' (2019) 88 *Fordham Law Review* 499.

JSTOR: http://www.jstor.org/stable/20024652 (accessed 14 March 2023).

Kaiser B *Targeted: The Cambridge Analytica whistleblower's inside story of how big data, Trump, and Facebook broke democracy and how it can happen again* (HarperCollins, 2019).

Katyal SK 'Private accountability in the age of artificial intelligence' (2019) 66 *UCLA Law Review* 54.

Kenya Affordable Housing Programme: Development Framework Guidelines (October 2018) <https://www.housingandurban.go.ke/wp-content/uploads/2018/11/Develop ment-Framework-Guidelines-Release-Version.pdf> (accessed 14 March 2023).

'Kenya Govt unveils 11 Member Blockchain & AI Taskforce headed by Bitange Ndemo' *Kenyan Wallstreet* <https://kenyanwallstreet.com/kenya-govt-unveils-11-member-blockchain-ai-taskforce-headed-by-bitange-ndemo/> (accessed 14 March 2023).

'Kenya's new curriculum to teach coding in Primary and Secondary Schools' <https://www. thecitizen.co.tz/tanzania/news/east-africa-news/kenya-s-new-curricu lum-to-teach-coding-in-primary-and-secondary-schools-3789706> *The Citizen* (21 April 2022) (accessed 14 March 2023).

Kerrigan C *Artificial Intelligence: Law and Regulation* (Edward Elgar Publishing, 2022).

'Kimetrica' <https://kimetrica.com/about/> (accessed 14 March 2023).

Kirsh D 'Foundations of AI: The Big Issues' *Artificial Intelligence* (1991) 47 3–30.

Knuth DE *The Art of Computer Programming* Vol 1 3rd edn (Addison Wesley Longman, 1997).

Koffi HWS 'The Fintech Revolution: An Opportunity for the West African Financial Sector' (2016) 6:11 *Open Journal of Applied Sciences* 771–782.

Krittanawong C et al. 'Artificial Intelligence in Precision Cardiovascular Medicine' (2017) *Journal of the American College of Cardiology* 69.

Kwet M 'Digital colonialism: US empire and the new imperialism in the Global South' (2019) 60:4 *Race & Class* 3–26.

Legg S and Hutter M 'A collection of definitions of intelligence' *Frontiers in Artificial Intelligence and Applications* 157 (2007) 17.

Life-Saving Drones Fly Medicine to Tanzania's Remotest Spots' *Bloomberg.com* (8 March 2019) <https://www.bloomberg.com/news/articles/2019-03-08/life-saving-drones-deliver-medicine-to-tanzania-s-remotest-spots>.

Lindholt L *Questioning the universality of human rights: The African charter on human and peoples' rights in Botswana, Malawi and Mozambique* (Routledge, 2019).

Lisinski RP 'The current South African legal position on artificial intelligence: what can we learn from the United States and Europe?' (Doctoral dissertation, 2018).

Lohr S 'Facial recognition is accurate, if you're a white guy' (2018) 9 *New York Times*.

MacDonald R St J, Matscher F and H Petzold (eds) *The European system for the protection of human rights* (Dordrecht: Nijhoff, 1993).

'Made-In-Cameroon Drones Are Taking To The Skies – And A Certain 26-Year-Old Is Leading The Charge' *WeeTracke*r <https://weetracker.com/2019/03/08/cameroonian-drones-william-elong/> (accessed 14 March 2023).

Maino R et al. *FinTech in Sub-Saharan African Countries: A Game Changer?* (International Monetary Fund, 2019).

Makulilo AB 'Data Protection Regimes in Africa: too far from the European "'adequacy" standard?' (2013) 3:1 *International data privacy law* at 42–50 (accessed 14 March 2023).

Matchar E 'Can AI Tell if a Child Is Malnourished?' *Smithsonian Magazine* <https://www.smithsonianmag.com/innovation/can-ai-tell-if-child-is-malnourished-180969268/>.

Mauritius Artificial Intelligence Strategy (MAIS) Report by the Working Group on AI (November 2018) <http://mitci.govmu.org/English/Documents/2018/Launching%20Digital%20 Transformation%20Strategy%20191218/Mauritius%20AI%20Strategy%20(7).pdf>.

Mauritius Artificial Intelligence Strategy (MAIS) (November 2018: Report by the Working Group on AI) at 31–63.

Mayer B 'Human rights in the Paris Agreement' (2016) 6:1–2 *Climate Law* 109–117.

McGinnis JO *Accelerating Democracy: Transforming Governance Through Technology* (Princeton University Press, 2013).

McGregor L, Murray D & Ng V 'International Human Rights Law as a Framework for Algorithmic Accountability' (2019) 68:2 *International and Comparative Law Quarterly* 309–343 <https://www.cambridge.org/core/article/international-human-rights-law-as-a-framework-for-algorithmic-accountability/1D6D0A456B36BA7512A6AFF17F16E9B6> (accessed 14 March 2023).

Miller CC 'When Algorithms Discriminate' *The New York Times* (9 July 2015) <https://www.nytimes. com/2015/07/10/upshot/when-algorithms-discriminate.html> (accessed 14 March 2023).

Ministry of Communication Technology <https://www.commtech.gov.ng/the-ministry/about-the-ministry.html>.

Ministry of Information, Communication and Technology of Kenya 'Emerging Digital Technologies for Kenya: Exploration and Analysis' (July 2019) <https://www.ict.go.ke/blockchain.pdf> (accessed 14 March 2023).

Ministry of Information Technology, Communication and Innovation 'Home' <http://mitci.govmu. org/English/Pages/default.aspx> (accessed 14 March 2023).

Minkler L *The state of economic and social human rights: a global overview* (Cambridge University Press, 2013).

Molnar P & Gill L 'Bots at the Gate: a human rights analysis of automated decision-making in Canada's immigration and refugee system' (Citizen Lab and International Human Rights Program Faculty of Law, University of Toronto, 2018).

Monett D & Lewis CWP 'Getting clarity by defining artificial intelligence – a survey' in Müller VC (ed.) *Philosophy and Theory of Artificial Intelligence 2017*.

Müller VC (ed.) *Philosophy and Theory of Artificial Intelligence 2017* (Berlin: Springer, 2018).

Mulshine M 'A major flaw in Google's algorithm allegedly tagged two black people's faces with the word "gorillas"' *Business Insider* <https://www.businessinsider.com/google-tags-black-people-as-gorillas-2015-7> (accessed 14 March 2023).

Murray R *The African Charter on Human and Peoples' Rights: A Commentary* (Oxford University Press, 2019).

Mutua M *Human rights: A political and cultural critique* (University of Pennsylvania Press, 2002).

Newman N 'The Costs of Lost Privacy: Consumer Harm and Rising Economic Inequality in the Age of Google' (24 September 2013) (2014) *WMLR* Vol 40 Issue 2 SSRN <https://ssrn.com/abstract=2310146>.

Nilsson NJ *The Quest for Artificial Intelligence: A History of Ideas and Achievements* (Cambridge University Press, 2009).

OECD: 'Forty-two countries adopt new OECD Principles on Artificial Intelligence' <https://www.oecd.org/science/forty-two-countries-adopt-new-oecd-principles-on-artificial-intelligence.htm>.

OECD: 'Legal Instruments' <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449>.

OECD AI Policy Observatory: 'National AI Policies and Strategies' <https://oecd.ai/en/dashboards/ overview> (accessed 14 March 2023).

Oh I 'Islamic Voices and the Definition of Human Rights' (2011) 53:3 *Journal of Church and State* 376–400.

OHCHR: 'Declaration on the Right to Development' <https://www.ohchr.org/en/professional interest/pages/righttodevelopment.aspx>.

OHCHR: 'Guiding Principles on Business and Human Rights: Implementing the United Nations "Protect, Respect and Remedy" Framework' (New York and Geneva, 2011) <https://www. ohchr.org/en/issues/business/pages/businessindex.aspx>.

OHCHR: ‘Human Rights Bodies’ <https://www.ohchr.org/en/hrbodies/Pages/Human Rights Bodies.aspx> (accessed 14 March 2023).

OHCHR: ‘Realizing the Right to Development: Essays in Commemoration of 25 Years of the United Nations Declaration on the Right to Development’ (New York, Geneva: United Nations, 2013).

OHCHR: ‘Search by Translation’ <https://www.ohchr.org/EN/UDHR/Pages/SearchByLang.aspx> (accessed 14 March 2023).

OHCHR ‘The Universal Declaration of Human Rights in six cross-cutting themes’ <https://www.ohchr.org/EN/UDHR/Pages/CrossCuttingThemes.aspx> (accessed 14 March 2023).

OHCHR: Vienna Declaration and Programme of Action <https://www.ohchr.org/en/profes sionalinterest/pages/vienna.aspx> (accessed 14 March 2023).

Okafor OC *The African Human Rights System, Activist Forces and International Institutions* (Cambridge University Press, 2007).

Okafor OC ‘A Regional Perspective: Article 22 of the African Charter on Human and Peoples’ Rights’ in OHCHR: ‘Realizing the Right to Development: Essays in Commemoration of 25 Years of the United Nations Declaration on the Right to Development.’

Okafor OC ‘Report of the Independent Expert on Human Rights and International Solidarity’ UN (2018) ‘Commissioned Reports, Studies, and Public Policy Documents’ Paper 200 <https://digitalcommons.osgoode.yorku.ca/reports/200> (accessed 14 March 2023).

One Trust Data Guidance: ‘African Bodies: AU AI Working Group holds first session’ <https://www.dataguidance.com/news/african-bodies-au-ai-working-group-holds-first-session> (accessed 14 March 2023).

Onu CG *Harnessing infant cry for swift, cost-effective diagnosis of perinatal asphyxia in low-resource settings* (IEEE, 2014).

Onu CG et al. ‘Neural Transfer Learning for Cry-based Diagnosis of Perinatal Asphyxia’ (2020) arXiv:190610199 [cs, eess, stat] <http://arxiv.org/abs/1906. 10199> arXiv: 1906.10199.

Onu CG et al. ‘Ubenwa: Cry-based diagnosis of birth asphyxia’ (2017) arXiv preprint arXiv:171106405.

Open AIR: ‘7 Ways that African States are Legitimizing Artificial Intelligence’ <https://openair. africa/7-ways-that-african-states-are-legitimizing-artificial-intelligence/> (accessed 14 March 2023).

Orji UJ ‘The African Union Convention on Cyber security: A Regional Response Towards Cyber Stability?’ *Masaryk University Journal of Law and Technology* 12.2 (2018) 91–129.

Osoba OA & Welser W IV *An intelligence in our image: The risks of bias and errors in artificial intelligence* (Rand Corporation, 2017).

Pagallo U & Quattrocolo S ‘The impact of AI on criminal law, and its twofold procedures’ in Woodrow B and Pagallo U *Research Handbook on the Law of Artificial Intelligence*.

Perry MJ *A Global Political Morality: Human Rights, Democracy, and Constitutionalism* (Cambridge University Press, 2017).

Petzold H 'The convention and the principle of subsidiarity' in MacDonald R St J, Matscher F and H Petzold (eds) *The European system for the protection of human rights*.

Pew Research Center: 'Artificial Intelligence and the Future of Humans' *Internet, Science & Tech* (10 December 2018) <https://www.pewresearch.org/internet/2018/12/10/artificial-intelli gence-and-the-future-of-humans/> (accessed 14 March 2023).

Pocar F 'Some Thoughts on the Universal Declaration of Human Rights and the Generations of Human Rights' *Intercultural Human Rights Law Review* 10 (2015) 43.

Pogge T & Sengupta M 'Assessing the sustainable development goals from a human rights perspective' (2016) 32:2 *Journal of International and Comparative* Social *Policy* 83–97.

The Presidency: 'President appoints Commission on Fourth Industrial Revolution' </press-statements/president-appoints-commission-fourth-industrial-revolution>.

Rajagopal B Rajagopal *International law from below: Development, social movements and third world resistance* (Cambridge University Press, 2003).

Ramaphosa C 'A national strategy for harnessing the Fourth Industrial Revolution: The case of South Africa' *Brookings* (10 January 2020) <https://www.brookings.edu/blog/africain-focus/2020/01/10/a-national-strategy-for-harnessing-the-fourth-industrial-revolution-the-case-of-south-africa/> (accessed 14 March 2023).

Raub M 'Bots, bias and big data: artificial intelligence, algorithmic bias and disparate impact liability in hiring practices' (2018) 71 *Ark Law Review* 529.

'The reality of the AU's response to crises' *World ReliefWeb* <https://reliefweb.int/report /world/reality-au-s-response-crises>.

Reichert E 'Human rights: An examination of universalism and cultural relativism' *Journal of Comparative Social Welfare* 22.1 (2006) 23–36.

Renteln AD *International human rights: universalism versus relativism* (Quid Pro Books, 2013).

Republic of Mauritius: 'Artificial Intelligence can ensure a better society and promote social inclusion and safety, says PM' <http://www.govmu.org/English/News/Pages/Artificial-Intelligence-can-ensure-a-better-society-and-promote-social-inclusion-and-safety,-says-PM.aspx> (accessed 14 March 2023).

Risse M 'Human rights and artificial intelligence: An urgently needed agenda' (2019) *Human Rights Quarterly* 41.1 1–16.

'Running in Circles: Uncovering the Clients of Cyberespionage Firm Circles' *The Citizen Lab* (1 December 2020) <https://citizenlab.ca/2020/12/running-in-circles-uncovering-the-clients-of-cyberespionage-firm-circles/> (accessed 14 March 2023).

Saiz I & Donald K 'Tackling inequality through the Sustainable Development Goals: human rights in practice' (2017) 21:8 *The International Journal of Human Rights* 1029–1049.

Salaudeen A 'Rwanda has enlisted anti-epidemic robots in its fight against coronavirus' *CNN* <https://www.cnn.com/2020/05/25/africa/rwanda-coronavirus-robots/index.html> (accessed 14 March 2023).

Scherer MU 'Regulating artificial intelligence systems: Risks, challenges, competencies, and strategies' (2015) *Harvard Journal of Law & Technology* 29 353.

Schwab K 'The Fourth Industrial Revolution: What it means and how to respond World Economic Forum' (2016) <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolu tion-what-it-means-and-how-to-respond/> (accessed 14 March 2023).

Seadle M 'The Great Hack' (documentary film). Produced and directed by Karim Amer and Jehane Noujaim, Netflix, 2019. 1 hour 54 minutes (2019) *Journal of the Association for Information Science and Technology*.

'Self-driving cars in Africa' *iAfrikan.com* (25 July 2019) <https://iafrikan.com/2019/07/25/the-future-of-self-driving-cars-in-africa/> (accessed 14 March 2023).

Sen A 'Elements of a Theory of Human Rights' (2004) 32 *Philosophy & Public Affairs* 315.

Shogbola O 'FG to Establish Two New Agencies' <https://scienceandtech.gov.ng/2018/08/01/fg-to-establish-two-new-agencies/> (accessed 14 March 2023).

Sital K, Getgen JE and Koh SA 'Enhancing enforcement of economic, social, and cultural rights using indicators: A focus on the right to education in the ICESCR' (2010) *Human Rights Quarterly* 32 253.

'Smart CCTV Networks Are Driving an AI-Powered Apartheid in South Africa' <https://www.vice.com/en_us/article/pa7nek/smart-cctv-networks-are-driving-an-ai-powered-apartheid-in-south-africa> (accessed 14 March 2023).

'Smart cities' *iAfrikan.com* (5 November 2019) <https://iafrikan.com/2019/11/05/smart-cities-artificial-intelligence-urbanisation-senegal/> (accessed 14 March 2023).

Smuhana "Hi'h-Level Expert Group on Artificial Intelligence' *Shaping Europe's digital future – European Commission* (14 June 2018) <https://ec.europa.eu/digital-single-market/en/high-level-expert-group-artificial-intelligence>.

'South Africa adopts new audio tech to find location of gunshots and immediately alert police' *Global News* <https://globalnews.ca/news/4446595/south-africa-shotspotter-gun-tech/> (accessed 14 March 2023).

Ssenyonjo M 'Responding to human rights violations in Africa: Assessing the role of the African Commission and Court on Human and Peoples' Rights (1987–2018)' *International Human Rights Law Review* 7.1 (2018) 1–42.

Staff Writer: 'South Africa has plans for self-driving cars – but the law needs to change first' <https://businesstech.co.za/news/motoring/309052/south-africa-has-plans-for-self-driving-cars-but-the-law-needs-to-change-first/> (accessed 14 March 2023).

Staff Writer 'Watch: Ramaphosa delivers speech via hologram' <https://business tech.co.za/news/ technology/327703/watch-ramaphosa-delivers-speech-via-hologram/> (accessed 14 March 2023).

'Stratégie européenne pour l'intelligence artificielle / Vie publique.fr', <https://www.vie-publique.fr/rapport/38230-strategie-europeenne-pour-lintelligence-artificielle> (translated from French to English) (accessed 14 March 2023).

Sutherland E 'Digital privacy in Africa: cyber security, data protection & surveillance' *Data Protection & Surveillance* (22 June 2018).

'Technology is changing faster than regulators can keep up – here's how to close the gap' *World Economic Forum* <https://www.weforum.org/agenda/2018/06/law-too-slow-for-new-tech-how-keep-up/> (accessed 14 March 2023).

Tieku TK 'The African Union: Successes and Failures' *Oxford Research Encyclopedia of Politics* (2019).

Tieku TK 'Punching above Weight: How the African Union Commission Exercises Agency in Politics' *Africa Spectrum* (2021) 56(3) 254–273.

'Uganda installs Huawei's AI-powered facial recognition surveillance system "nationwide"' *BoingBoing* (20 August 2019) <https://boingboing.net/2019/08/20/uganda-installs-huaweis-ai-p.html> (accessed 14 March 2023).

'Uganda prepares to harness opportunities of 4th Industrial revolution' *Xinhua English.news.cn* <http://www.xinhuanet.com/english/2019-04/09/c_137963317.htm> (accessed 14 March 2023).

'UN expert urges adoption of draft declaration on international solidarity' *World' ReliefWeb*) <https://reliefweb.int/report/world/un-expert-urges-adoption-draft-declaration-international-solidarity> (accessed 14 March 2023).

UNHCHR: 'The right to privacy in the digital age'.

UN: 'The 2030 Agenda for Sustainable Development' <https://sdgs.un.org/goals> (accessed 14 March 2023).

UNESCO: 'Artificial Intelligence Needs Assessment Survey in Africa' 2021 23 (accessed 14 March 2023).

UNESCO: 'Botswana instigates policy dialogue on revised STI policy in Gaborone' (27 June 2011) <https://plusgooglecom/+UNESCO; <https://en.unesco.org/news/botswana-instigates-policy-dialogue-revised-sti-policy-gaborone> (accessed 14 March 2023).

'Using big data and machine learning to respond to the refugee crisis in Uganda' *UN Global Pulse* (5 March 2018) <https://www.unglobalpulse.org/2018/03/using-big-data-and-machine-learn ing-to-respond-to-the-refugee-crisis-in-uganda/> (accessed 14 March 2023).

Valle-Cruz D et al. 'A review of artificial intelligence in government and its potential from a public policy perspective' *Proceedings of the 20th Annual International Conference on Digital Government Research* 2019.

Van Boven T 'Categories of rights' *International Human Rights Law* 2 (2010) 143–156.

Vasak K 'For the Third Generation of Human Rights: The Rights of Solidarity' (Inaugural Lecture 10th Study Session of the International Institute of Human Rights: Strasbourg, July 1979).

Viljoen F 'Africa's contribution to the development of international human rights and humanitarian law' (2001) 1 *African Human Rights Law Journal* 18.

Viljoen F 'Africa's contribution to the promotion and protection of human rights' *MOOC on Promoting and Protecting Human Rights: a Global Overview* (Global Campus of Human Rights, 2020).

Viljoen F 'From a cat into a lion? An overview of the progress and challenges of the African human right system at the African Commission's 25-year mark' *Law, Democracy & Development* 17 Special issue 1 (2013) 298–316.

Vincent J 'Google is absorbing DeepMind's health care unit to create an AI assistant for nurses and doctors' *The Verge* (13 November 2018) <https://www.theverge.com/2018/11/13/ 18091774/google-deepmind-health-absorbing-streams-team-ai-assistant-nurse-doctor>.

Wahlgren P 'A general theory of artificial intelligence and law' (1984) 94 *Legal knowledge-based systems JURIX* 79–83.

Wang P 'On Defining Artificial Intelligence' (2019) 10:2 *Journal of Artificial General Intelligence* 1–37 <https://content.sciendo.com/view/journals/jagi/10/2/article-p1.xml> (accessed 14 March 2023).

'The Water, Peace and Security PartnershipIHE Delft Institute for Water Education' <https://www.un-ihe.org/water-peace-and-security-partnership> (accessed 14 March 2023).

Weaver JF *Robots Are People Too* (Praegar Publishing, 2013).

Webber Wentzel: 'Artificial Intelligence has POPIA implications' <https://www. webberwentzel. com/News/Pages/artificial-intelligence-has-popia-implications.aspx> (accessed 14 March 2023).

Wei L *Legal risk and criminal imputation of weak artificial intelligence* (IOP Publishing, 2019).

'What is the future of driverless cars in Sub Saharan Africa?' *ResearchGate* <https://www.re searchgate.net/post/What_is_the_future_of_driverless_cars_in_Sub_Saharan_Africa> (accessed 14 March 2023).

Winner L 'Do Artifacts Have Politics?' *Daedalus* Vol. 109 No. 1 1980 121–136.

Woodrow B and Pagallo U *Research Handbook on the Law of Artificial Intelligence* (Cheltenham, UK: Edward Elgar Publishing, 2018).

World Economic Forum: 'Here's why you didn't get that job: your name' <https://www.weforum. org/agenda/2017/05/job-applications-resume-cv-name-descrimination/> (accessed 14 March 2023).

Wylie C (Mindf* ck) *Inside Cambridge Analytica's plot to break the world* (Profile Books, 2019).

Zenvus 'Startup' <https://startup.info/zenvus/> (accessed 14 March 2023).

Zenvus 'Intelligent solutions for farms and gardens' <https://www.zenvus.com/> (accessed 14 March 2023).

Chapter 4

De-regulate and re-regulate: Artificial intelligence and data governance in Africa

4.1 Introduction

Following the outbreak of the Covid-19 pandemic, most of the world has been catapulted into adopting technologies that were otherwise mostly present in more economically developed countries. Among these technologies is the use of artificial intelligence (AI) for a variety of reasons, including the processing and analysis of large data streams. A comprehensive definition of AI is given in chapter 1. However, for the purpose of this chapter, understanding the distinction between basic AI and advanced AI is important for contextualisation. Basic AI is concerned with cognitive abilities such as memory, attention and language, as well as some executive functions like anticipation and decision-making, with limited reference to the past. Most applications of this kind of AI typically aim to improve the performance of business analytics solutions and to enhance the functioning of digital platforms. Typical examples include chatbots, online matching and credit scoring among other things.[1] Advanced AI on the other hand, goes a step further and aims to recreate or simulate human cognitive abilities such as perception, vision, and spatial processing. The intention is to, as closely and accurately as possible, mimic the human mind and enable the analysis of unstructured data such as texts, images, and audio data. Examples of typical uses include facial and speech recognition, medical diagnoses, transportation, and urban planning, as well as logistics, security, and safety.[2]

Machine learning (ML) is arguably the most popular application of AI and has greatly enhanced the performance of AI. ML algorithms are automatically built from data, and the richer the dataset, the better they perform. Where the conventional rules-based approaches would tell the algorithm what to do in each state of the world, ML by contrast involves using algorithms to deconstruct data, learn from it, and make a determination or prediction, as a result.[3] In this sense, ML AI is only as good as the data that is fed to it. This is why AI is often referred to as a 'data-driven technology.' For these reasons, it is therefore imperative that wherever AI is employed, the data should be of a high quality.

Law and policy can be instrumental in ensuring that AI uses are accelerated and allowed to thrive in developing African nations that are pursuing sustainable development. Sustainable development can be achieved by ensuring that the current regulatory environment encourages and fosters competition, interoperability and safety within the data ecosystems on which AI operations depend.

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1 Strusani D and Houngbonon GV *The Role of Artificial Intelligence in Supporting Development in Emerging Markets*.
2 'Defining AI – One Hundred Year Study on Artificial Intelligence (AI100)' .
3 Strusani and Houngbonon at 2.

This chapter focuses on three key areas that affect the quality of data. These are data availability, data interoperability and data integrity and security. The focus is on Africa's readiness to adopt AI-backed technologies to meet some of its developmental goals as set out in the African Union's Agenda 2063,[4] as well as the goals of the AU's Digital Transformation Strategy (DTS).[5] The chapter firstly details the usefulness of AI technologies to a developing country by looking into the spaces in which AI-backed technologies could have the biggest positive impact, as well as detailing any shortcomings or negative effects that may occur. Secondly, there is an interrogation into the state of policy and law on the continent that relate directly to the three identified areas above that affect the quality of data, with the aim of answering the question of whether the current policy/legal environment on the continent supports the creation, movement, usability and security of data which will ultimately determine the effectiveness of the use of AI in Africa. Thereafter, suggestions are made on which key policy areas need re-imagining or reinforcing to better support the adoption of AI technologies in Africa, if at all they are necessary.

4.2 The relationship between artificial intelligence and development

The use of AI is now a part of everyday life in our modern-technology inclined societies. It is already influencing a wide range of areas such as productivity, the environment and related outcomes, equality and inclusion, both positively and negatively.[6] The use of AI is also rapidly unearthing new practices in the fields of business, corporate practices, and governmental policy. For example, in business and, to an extent, corporate practice ML and robotics with deep learning capabilities are already solving cognitive problems commonly associated with human intelligence and slowly replacing humans, owing to their higher predictive power, efficiency and improved results.[7] In agriculture, AI deployment is helping to improve crop yields by providing real-time advisories about pests and market predictions. In retail, AI is being used to personalise preference-based advertising and customer-demand anticipation, inventory, and delivery management.[8]

The intellectual and financial advantages that come with the growth and use of AI illustrate the potential that AI has for developing countries in their developmental agendas. The world is currently fascinated with the idea of 'sustainable development' with the United Nations' 17 Sustainable Development Goals (SDGs) defining the development agenda for most nations of the world. The African Union (AU) has complemented the spirit and purport of the UN SDGs by adopting its own strategic blueprint of inclusive SDGs, aptly named the AU's Agenda 2063.[9] Agenda 2063 has a clear vision made up of 7 aspirations, 20 goals, 39 priority areas and is a shared framework that aims to accelerate inclusive growth and collective sustainable development for Africa

4 AU: 'Agenda 2063 Report of the Commission on the African Union Agenda 2063 The Africa We Want in 2063' (Agenda 2063 Report).
5 AU: 'The Digital Transformation Strategy for Africa (2020–2030)'.
6 Vinuesa R et al. 'The Role of Artificial Intelligence in Achieving the Sustainable Development Goals' at 1.
7 Sachs JD *The Age of Sustainable Development* at 260; Harari YN *Homo Deus: A Brief History of Tomorrow* at 285.
8 Shiohira K and Dale-Jones B 'Interoperable Data Ecosystems' at 80.
9 Agenda 2063 Report

by the year 2063.[10] Agenda 2063 and the SDGs are mutually supportive and coherent for the most part, with minor differences that do not otherwise affect how the agendas are implemented. Such differences largely relate to specific steps that need to be taken to attain certain goals given the prevailing socio-economic conditions unique to the African continent. The adoption of AI in Africa has been received with scepticism, largely owing to fears related to job losses due to AI. While these fears are justified and real (especially in more economically developed countries), in low-income countries, many see AI as a tool that offers new opportunities to break the cycle of poverty and aid in the attainment of the goals of Agenda 2063.[11]

Most fears about mass AI adoption are concerned with Advanced AI, specifically human-level machine intelligence (HLMI), which is idealised as being able to perform as effectively as an extremely gifted human in all intellectual tasks.[12] HLMI is feared because, not only would it make certain jobs obsolete in the short term, it could also supplant humankind as the apex species on the planet in the long term.[13] The use of basic AI has already been causing job displacements *en masse*. For example, Goldman Sachs at its height in 2000, employed 600 traders at its US cash equities trading desk.[14] As of 2017, there were just two equity traders left with automated trading programs having taken over the rest of the work.[15] The current research landscape in so far as it relates to the African context, has not substantively explored the various ways AI can abet Agenda 2063. However, the opposite is true as it relates to the UN SDGs which can serve as an indicator on how AI can directly influence the attainment of Agenda 2063. SDG 1 (no poverty), SDG 8 (decent work and economic Growth), SDG 9 (industry, innovation and infrastructure) and SDG 10 (reduced inequalities) could be directly or indirectly impacted by the adoption and use of AI if such technologies continue to proliferate especially in countries where there is little social protection against unemployment and labour rights.[16] SDG 1 and SDG 8 are fundamentally encompassed in goal (AG) 1[17] of Agenda 2063, while SDG 8 and SDG 10 are referenced in the Agenda 2063 AG 4[18] and AG 20[19] respectively. In the study conducted by Vinuesa et al.,[20] it was

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10 AU: 'Agenda 2063 The Africa We Want: Background Note' (Agenda 2063 Background Note).

11 Lohr S 'From Agriculture to Art – the A.I Wave Sweeps In'.

12 Goralski MA and Tan TK 'Artificial Intelligence and Sustainable Development'.

13 Goralski and Tan.

14 Byrnes N 'As Goldman Embraces Automation, Even the Masters of the Universe Are Threatened'.

15 Ibid.

16 Goralski and Tan.

17 Goal 1 seeks to achieve a high standard of living, quality of life and well-being for all citizens. The priority areas include the provision of incomes, jobs and decent work; lessening poverty, inequality and hunger; increasing social security and protection, including persons with disabilities and the provision of modern, affordable and liveable habitats and quality basic services.

18 Goal 4 speaks to the need for transformed economies. The priority areas include sustainable and inclusive economic growth; science, technology and innovation driven manufacturing, industrialisation and value addition as well as strengthening economic diversification and resilience.

19 Goal 20 speaks to Africa taking full responsibility for financing her development Goals. To this end, the agenda prioritises the establishment of African capital markets, fiscal systems and public sector revenue and furthering development assistance.

20 Vinuesa et al. at 2.

found that 59 targets (35% of all SDGs) could be negatively impacted by the development and use of AI.[21] One such example is climate change (SDG 13 and AG 7) where the high-energy needs (non-carbon neutral technology) for AI applications are noted.[22] Additionally, in regions with less ethical scrutiny, transparency, and democratic oversight, AI use could enable nationalism, hate towards minorities, and bias election outcomes, thus damaging social cohesion, democratic principles, or even human rights (SDG 16 and AG 11).[23]

However, on the other side of the spectrum, there is evidence to support the notion that AI may act as a developmental enabler. Chiefly, the use of AI has the potential to reduce poverty and to boost shared prosperity. The deployment of AI technologies can be highly disruptive (positively), in that it can result in changes to the cost of or access to products or services, or can drastically change how we interact, make products and gather information.[24] A number of developing countries have already been using AI to solve critical development challenges. One area of prominent usage is in the financial services sector where progress in basic ML algorithms, combined with the limited burden of legacy technologies and a growing mass of technology users, have enabled emerging markets to implement basic AI solutions such as credit scoring and targeted advertising.[25] Real-life examples that deliver financial services to the poorest include M-Shwari[26] in East Africa, M-Kajy[27] in Madagascar, and MoMo Kash in Cote d'Ivoire.[28] M-Shwari is a good example of AI use and uses ML to predict the probability of default of potential borrowers, which allowed it to deliver small loans to 21 million Kenyans by the end of 2017.[29]

Vinuesa et al. also found that AI may positively influence and assist in the attainment of at least 134 targets (79%) across all SDGs, generally through technological improvements.[30] For example, by 'supporting the provision of food, health, water, and energy services to the population', AI may act as an enabler for all the targets on poverty (SDG 1 and AG 1), quality education (SDG 4 and AG 2), clean water and sanitation (SDG 6 and AG 7), affordable and clean energy (SDG 7 and AG 7), and sustainable cities (SDG 11 and AG 1).[31]

Outside of these developmental goals, AI also has the potential to abet the attainment of the AGs set out in AU's DTS for Africa.[32] The DTS aims to exploit digital technologies and innovation to catapult Africa's societies and economies into powerhouses while promoting Africa's integration, inclusive economic growth, job creation and promoting the eradication of poverty and digital divide for socio-economic development.[33] The DTS emphasises how fewer legacy challenges on the continent present

21 Ibid.
22 Ibid.
23 Ibid.
24 Strusani and Houngbonon at 3.
25 Ibid.
26 Safaricom 'M-Shwari'.
27 M-Kajy 'Orange – Orange Money'.
28 MoMo Kash 'MTN Ivory Coast'.
29 Strusani and Houngbonon at 3.
30 Vinuesa et al. at 2.
31 Ibid.
32 AU: 'The Digital Transformation Strategy for Africa (2020–2030)'.
33 Ibid.

Africa with the rare opportunity to leapfrog into a new digitised environment and that it is therefore important that the continent be prepared for emerging technologies such as AI among other things which can be instrumental in the realisation of DGs.[34] Under policy recommendations and proposed actions, the DTS mentions AI twice as it firstly speaks to the need to encourage the public and private sectors to embrace the emerging technologies including AI and the need to encourage or include public operators in strategies aimed at embracing the emerging technologies such as AI through research and development.[35]

AI as a key enabler for sustainable development has been further confirmed by the AU High-Level Panel on Emerging Technologies (APET), who have prioritised and recommended AI as an emerging technology worth harnessing for Africa's socio-economic development. The organisation launched the APET 'AI for Africa' report[36], which provides guidelines for African countries on how best to exploit AI-based technologies for the continent's advancement.[37]

The Table below shows some of the key opportunities and risks associated with the adoption of AI in the development agenda for most nations as identified by the International Finance Corporation (IFC).

Summary of opportunities and risks associated with the use of AI in developing countries

Opportunities	Risks
New products and business models – including leapfrogging solutions, solutions for bottom of pyramid individuals, and easier access to credit.	Obsolescence of traditional export-led path to economic growth.
Automation of core business processes – leading to lower product costs.	Increased digital and technological divide.
Human capital development.	Transformation of job requirements and disruption of traditional job functions.
Innovation in government services.	Privacy, security, and public trust.

Source IFC[38]

4.3 Data availability in Africa

As has been mentioned, AI is a data-driven technology. It's effectiveness and utility to developing countries is therefore dependent on the availability of data, even before the quality and security of the data is scrutinised. Data availability in this context largely refers to the ability of data to be created, stored and moved. Therefore, when talking of data availability, it is important to interrogate whether the current policies, laws and

34 Ibid.
35 Ibid.
36 AUDA NEPAD: 'AI for Africa: Artificial Intelligence for Africa's Socio-Economic Development'.
37 AUDA-NEPAD: 'The African Union Artificial Intelligence Continental Strategy for Africa'.
38 IFC: 'Artificial Intelligence in Emerging Markets'.

physical infrastructure adequately support the creation, storage and processing of data, as well as the ability to freely move it across the continent. An adequately capable network and digital infrastructure is an important pre-condition if the continent wishes to fully harness the power of AI for sustainable development.

The creation of data is not a complex phenomenon to comprehend. Countless bytes of data are generated by humans every day through the use of phone apps, internet of things-connected devices, online shopping and many other ways.[39] It therefore follows that perhaps the bigger problem when it comes to the creation of data (that is useful for AI) within the African context has to do with the rates of internet connectivity in Africa. The Internet in Africa is limited by a lower penetration rate when compared to the rest of the world. Indexes that track connectivity make use of measurable variables such as the number of internet service provider (ISP) subscriptions, the number of hosts, mobile data consumption, available bandwidth etc. The general consensus, with these variables in mind, is that Africa is far behind in the 'digital divide'.[40] According to the Global System for Mobile Communications (GSMA), only 28% of the population of sub-Saharan Africa had mobile internet connectivity in 2020 compared to 49% of people globally.[41] In 2020, GSMA also reported that a further 19% of people lived in areas not covered by mobile networks and that an additional 53% did not use mobile internet despite having coverage.[42]

4.3.1 *Why does Africa have an internet connectivity issue?*

Africa's internet connectivity issues are largely owing to two main reasons. Firstly, the telecommunication (telecom) markets are heavily regulated, and secondly, the cost of connectivity *vis-à-vis* the demand for internet services often does not justify the investment. The e-Connectivity index by Investment Monitor (2021) found that Africa's internet communications market is heavily regulated and closed off to new service providers and telecom companies.[43] In 2019, the average return on investment in the African telecom sector was 55.4% of revenue, which illustrates the huge profits that current service providers can make.[44] Such high returns on investment also mean that established service providers will favour monopolies, in the process making it difficult for new prospective service providers to penetrate the market. In addition to operating licences being very expensive in African markets, the process can also be very lengthy and bureaucratic.[45]

In South Africa, for instance, the registration and granting of electronic communication licences is a function performed by the Independent Communications Authority of South Africa (ICASA) under the Electronic Communications Act.[46] Section 5(2) and (4) provides that ICASA may upon application and due consideration in the prescribed manner, grant (individual and class) licences for the electronic communications network services (ECNS) and electronic communications services (ECS). Of interest in this

39 'How Can Africa Monetise Big Data?'
40 GSMA 'The State of Mobile Internet Connectivity 2021'.
41 Ibid. at 66.
42 Ibid.
43 Mitchell J 'African E-Connectivity Index 2021: The Final Frontier and a Huge Opportunity'.
44 Statista: 'Africa: Return on Investment in Telecom Sector 2019'.
45 Mitchell.
46 Act 36 of 2005 Ch. 3.

context is the fact that applications for individual ECNS licences can only be lodged with the authority after a policy directive has been issued by the Minister of Communications. Thereafter, the authority may issue the invitation to apply (ITA) wherein all interested persons may apply. The Act also mandates ICASA to prescribe the necessary formalities for the application process. Section 5(8) specifies that the applicant must be a citizen of the Republic, or if a juristic person, must be registered under the laws of the Republic or have a principal place of business located within the Republic. Section 5(9) further provides that diversity must be considered in granting such a licence and promote empowerment of historically disadvantaged persons. Section 9(1) provides that any person may, upon invitation by the authority, apply for an individual licence, having satisfied requirements such as the percentage of equity ownership to be held by disadvantaged groups. While these provisions pursue noble aims, these conditions may be seen as deterrent factors, especially for international companies that are looking to expand operations.

In 1996, Ethiopia passed a proclamation to provide for the regulation of telecoms which established the Ethiopian Telecommunication Agency. The agency, among other things, licences and supervises operators of telecom services. At present, Ethio Telecom, a state-owned entity, maintains a monopoly over all telecom services in Ethiopia. In 2012, the country passed the Telecom Fraud Offence Proclamation[47] which, in section 9, essentially stops any other ISP from entering the market through the prohibition of establishing telecom infrastructure other than, or bypassing, the telecom infrastructure established by Ethio Telecom. Ironically, Ethiopia has the lowest recorded internet speeds in all of Africa, with the average at 1.2 Mbps.[48]

In the Gambia, the Information and Communications Act,[49] states that a person must not

(a) establish, install, operate or maintain an information or communications system; or

(b) provide an information and communications service or install information or communications apparatus, in the Gambia without an authorisation issued for that purpose in accordance with this Act and any other relevant legislation.

This authorisation can only be granted by the Minister on the recommendation of the Gambian Public Utilities Regulatory Authority (PURA).[50] In a report by Freedom on the Net,[51] It has been stated that PURA lacks expertise, enforcement power to fulfil its mandate while simultaneously lacking independence, with appointment to its board done on the recommendation of the Minister of Finance and Economic Affairs. It was also noted that the state-owned company, Gamtel, owns the sole fibre-optic cable running across the country and controls connection to internet thus requisitioning private telecoms to lease access to gateways to provide data services.[52]

47 Proclamation No. 761/2012 <https://chilot.me/2012/12/13/proclamation-no-7612012-telecom-fraud-offence-proclamation/>.
48 Gilbert P et al. 'North Africa Has World's Slowest Internet'.
49 Act No. 2 of 2009 <https://wipolex.wipo.int/en/text/238414> s 10(1).
50 S 10(2).
51 'The Gambia: Freedom on the Net 2021 Country Report'.
52 See Belson D, Paseka T and Tome J 'How the Gambia lost access to the Internet for more than 8 hours'.

In Zimbabwe, the Postal & Telecommunications Act[53] establishes the Postal and Telecommunications Regulatory Authority of Zimbabwe (POTRAZ) which, among other things, ensures the provision, and promotes the development, of telecom services, and exercises licensing and regulatory functions. POTRAZ may grant a licence to a service provider who wishes to provide Industry Public Fixed Telecommunication Services. These services include national long-distance telecom services, local access telecom services and all or any telecom facilities comprising fixed lines to be used by any operator for the provision of mobile telecom services and public data services. The licensing of Public Switched Telephone Network (PSTN) commonly referred to as fixed network is governed by government policy. Currently, the policy prescribes only two operators in this section. Although, the POTRAZ website states that these two operators are already operational, the same website lists Net-one, a state-owned enterprise, as the only licensed service provider. In addition, the current licence fees for a PSTN licence are marked at USD $100,000,000.[54]

On the other hand, Africa's coverage gap today is also because most people live in low-income, rural, and sparsely populated areas. Availing infrastructure to these areas tends to attract high costs and produces low returns, which makes it difficult to justify further deployments.[55] Furthermore, connecting landlocked countries such as Zambia, Zimbabwe and Malawi to submarine cables is highly problematic.[56] The same can be said for bigger countries with far-flung corners such as Tanzania and Nigeria. Thus, although these countries can readily receive submarine cables, the requirements to connect to remote areas are numerous.[57]

Additionally, Africa is a very large continent. One kilometre of installed cable can cost between $15,000 and $30,000. The last mile connection can be the most difficult part of building a network in Africa, particularly in rural and remote areas.[58] Globally, people living in rural areas are 37% less likely to use mobile internet than those living in urban areas, but the percentage jumps to 60% in Africa.[59] While smartphone adoption in Africa more than doubled between 2015 and 2020, smartphones still only account for around half of total connections.[60]

A combination of over-regulation and location limitations means that Africa is the most expensive region in the world for mobile data with a median cost of 1GB of data being about 4% of monthly GDP per capita.[61] These costs fall short of the Broadband Commission's affordability target to make entry-level data services less than 2% of monthly income per head by 2025.[62] Another less explored but worthy consideration has to do with the cost of smart phones and like devices. For example, in the Democratic Republic of the Congo, which has one of the highest mobile tariffs in the world, in 2019, it had a 26% tax on tariff costs and a 44% tax on device costs.[63]

53 Act No. 4 of 2000 s 3.
54 POTRAZ: 'Public Fixed Telecommunication Services'.
55 Mitchell.
56 GSMA.
57 Ibid.
58 Mitchell.
59 GSMA.
60 Ibid.
61 Mitchell.
62 GSMA.
63 Mitchell.

4.3.2 *Data localisation and the movement of data*

Having discussed the main factors influencing the creation of data in Africa, the next set of factors (storage and movement) can best be discussed under the banner of data localisation. Localisation often entails the construction of legislative barriers to data flows such as through data residency requirements and compulsory local data storage.[64] As data is valuable only when it is processed, transmitted, stored, and combined in the right way, data can be thought of as a public good in that it is not rivalrous and can be used by anyone without interfering with others. It is also non-excludable, which means that there are no natural barriers to multiple people using the same data at the same time.[65] Therefore within the African context, international and regional frameworks that facilitate cross-border data flows will be essential for the facilitation of AI-led sustainable development as well as the realisation of a common market and other continental developmental goals such as the realisation of the African Continental Free Trade Area (AfCFTA),[66] the AU's Agenda 2063[67] and, ultimately, 'The Digital Transformation Strategy for Africa (2020–2030)'.

In Africa, some countries allow data to flow freely in and out of their borders, probably because of a lack of laws suggesting otherwise; while others have enacted legislative frameworks that protect personal data which often contain data localisation clauses. In general, data localisation laws require the collection, processing and storage of personal data about citizens or residents of a country within the country.[68] When making a request to transfer data internationally, several approvals and a lot of bureaucracy are necessary.[69] In general, the transfer of personal data to a third country is allowed only under certain conditions, for instance when a third country has a law that requires sufficient safeguards (including privacy and security) for the processing of personal data.

Data localisation laws are often enacted because of fears relating to data security. Such laws aim to ensure that data is exchanged lawfully, for a specific purpose, and that it is not being used for unauthorised activities such as profiling or surveillance by governments or any other third party without consent and unless it is required by law.[70] This extremity in policy may present a practical challenge. Strict data-localisation rules that require the storage of all data locally, and not merely a copy, may render such data susceptible to security threats such as cyber-attacks and foreign surveillance.[71] Additionally, it may be inefficacious to do so. Most African countries are currently confronted with capacity constraints in that localisation capacity demands may vastly exceed national data-centre capacity. Likewise, while it is trite that digital transactions need to be supported by strong regulatory frameworks in areas like privacy,

64 Cory N 'Cross-Border Data Flows: Where Are the Barriers, and What Do They Cost?'
65 AU: Data Policy Framework.
66 World Bank: Open Knowledge.
67 Agenda 2063 Background Note.
68 Bowman C 'Data Localization Laws: An Emerging Global Trend' .
69 Ibid.
70 World Bank 'Data Protection and Privacy Laws – Identification for Development'.
71 AU: Data Policy Framework.

security, and consumer protection, these frameworks can be a major burden for businesses, especially small businesses and this can deter international exchanges.[72] In today's digital and physical economy, the relative freedom to move data, both personal and non-personal, without restrictions between countries brings positive results for organisations, individuals and countries.

The below table contains data localisation laws in Africa. It should be noted, however, that while many of these are not explicit localisation laws, there is concern as to how they will be interpreted and enforced, as they could become *de facto* data-localisation tools.[73]

Data-localisation laws in Africa

Country	Law	Implication on data flows
Cote-d'Ivoire	Law No. 2013-450 19 June 2013 article 7 on the protection of personal data[74]	Places an obligation on individuals or firms to get pre-approval from the regulator before processing personal data outside of the Economic Community of West African States (ECOWAS).
Ghana	Data Protection Act 843 of 2012[75] Section 89	While no provisions in Act 843 specifically pertain to transfer outside of national borders, selling or offering to sell the personal data of another person anywhere constitutes an offence punishable by a fine of not more than 2500 penalty units, a term of imprisonment of not more than five years, or both. An advertisement which indicates that personal data is or may be for sale is an offer to sell the data.
Kenya	Data Protection Act 24 of 2019. Section 44 read with section 25[76]	It does not contain the explicit data-localisation provisions which appeared in earlier drafts of the law. However, it still includes restrictive provisions governing personal data which require explicit consent for transfers of 'sensitive personal data', and that data controllers ensure and provide proof that personal data transferred abroad receives the same protection as if stored within the borders of Kenya.

(*continued*)

72 World Bank: 'Creating Value in the Data Economy: The Role of Competition, Trade, and Tax Policy'.

73 Cory N and Dascoli L 'How Barriers to Cross-Border Data Flows Are Spreading Globally, What They Cost, and How to Address Them'.

74 Data Guidance: Law No. 2013-450 19 June 2013 on the Protection of Personal Data.

75 Act No. 843 of 2012 <https://www.dataprotection.org.gh/index.php/resources/downloads/data-protection-act/38-data-protection-act-2012-act-843>.

76 Act No. 24 of 2019 <http://kenyalaw.org/kl/fileadmin/pdfdownloads/Acts/2019/TheDataProtectionAct__No24of2019.pdf>.

Country	Law	Implication on data flows
Nigeria	Guidelines for Nigerian Content Development in Information and Communications Technology (ICT) of 2015 and as amended in August 2019.[77]	It is required that all telecom companies, data and information companies and networking service companies interested in hosting subscriber and consumer data within Nigeria, should host such data within the country and in line with existing legislation
Rwanda	Ministerial order N°001/MINICT/2012 article 17[78]	It requires that all critical information data within government should be hosted in their national data centre.
Senegal	Law No. 2008-12 on the protection of personal data[79]	Transfer of personal data to another country is allowed only when that country provides sufficient legal protection for privacy, freedoms, and fundamental rights of individuals to the processing of personal data. Transfer of personal data to a country where these protections are not provided for is possible when the data subject has expressly consented to the transfer, or to protect the data subject's life, to safeguard the public interest, in exercise or defence of a legal claim, and in execution of a contract in the data subject's interest. President Macky Sall announced that all government data and applications will be hosted at the centre and be repatriated from foreign servers in hopes of strengthening Senegal's digital sovereignty.[80]
South Africa	Protection of Personal Information Act No. 4 of 2013 (POPIA) section 72	It makes the transfer of personal information outside of South Africa subject to certain exceptions, which include the requirement that the recipient of the data can offer complimentary protection of the data; the data subject consents to the data transfer; the transfer is necessary for the performance of a contract between the data subject and the responsible party or for the conclusion/performance of a contract in the interest of the data subject; and the transfer is for the benefit of the data subject.

77 Data Guidance: Guidelines for Nigerian Content Development in Information and Communication Technology (ICT) (as amended August 2019).
78 N°001/MINICT/2012.
79 Law No. 12 of 2008.
80 Swinhoe D 'Senegal to Migrate All Government Data and Applications to New Government Data Center'.

4.4 Technology neutrality and data interoperability

The potential for AI to effect meaningful and sustainable development is also largely dependent on technology neutrality. Technology neutrality complements data liberalisation calls, as in addition to data being able to move from one place to the other freely, such data must be usable in different formats and on different platforms. The term 'technology neutrality' is used to describe situations in which users are granted the freedom to willingly choose their preferred technology that satisfies and meets all their immediate needs and requirements for development, acquisition, use or commercialisation, without knowledge dependencies involved as information or data.[81] Therefore, for neutrality to be realised, it will be important that the underlying infrastructure affords equal opportunities and security (usually data) across the board to users.

On the other hand, the term 'interoperability' refers to the ability to share data and resources between disparate systems without restrictions.[82] Interoperability means that different apps, equipment, products, and systems can communicate and process data without user involvement.[83] This can either be done on a local area network (LAN) or wide area network (WAN). Essentially, interoperability allows different information systems to talk and comprehend information passed to each other.[84] There are two types of data interoperability: (1) syntactic interoperability, which is a prerequisite for semantic interoperability, enabling different software components to work together to facilitate communication and data exchange between two or more systems; and (2) semantic interoperability, which refers to the ability of computer systems to exchange meaningful data with clear, shared meaning.[85]

Interoperability between two or more systems requires that the systems can exchange, interpret, and present shared data in a way that is understood by the other. In Africa, several barriers currently exist and threaten interoperability. For instance, there are technical barriers such as the lack of technical-standards development, which hinders interoperability, along with inconsistent or poor data quality. Without the development of standards in these areas, there is no basis for facilitating communication.[86] There are also trust barriers where some organisations are doubtful of (1) other users' ability to keep data secure; and (2) such data not being used for untoward purposes. Some organisations also view limited access to data as a competitive advantage.[87] Data localisation requirements also provide a hurdle to interoperability. For example, where data transfer reporting on security and quality is required, many providers look to third-party resources, like data warehouses or registries, to help with the reporting strain. This adds to operational costs.[88] System design and usability can also be a barrier to interoperability where vendors and developers who don't engage end users in system design and functionality or even workflow automation software selection and utilisation.[89]

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81 AU: Data Policy Framework.
82 'What is Interoperability?'
83 Hare V 'What Is Interoperability and Why Is It Important?'
84 Ibid.
85 'What is Interoperability?'
86 'Barriers to Interoperability in Healthcare Information Exchange.
87 Ibid.
88 'Barriers to Interoperability in Healthcare Information Exchange'.
89 Ibid.

The resultant scenario owing to these barriers, the majority of which exist on the continent, is that data silos become prevalent. Data silos mean that data is stored in multiple standalone systems and often is incompatible with other data sets. This means that data, in addition to localisation laws, may not be able to move even among and between organisations. In this sense, the data sets on which effective AI can learn is lessened and where it is attainable, it is expensive to do so. Technology neutrality and interoperability should therefore be prioritised. The best way to tackle a lack of interoperability would be to adopt and, where necessary, create technical standards that allow data to be transmitted, stored, and accessed irrespective of the information system in which it is stored or created.[90]

4.5 Data integrity and security in Africa

Data security commonly refers to the prevailing norms, policies, regulations and laws that seek to protect the confidentiality, integrity, and availability of data from unauthorised access, throughout the entire lifecycle of data.[91] Data security encompasses aspects such as the physical security of hardware of data centres and storage devices, the logical security of networks, applications and software as well as the administrative access controls.[92] Therefore, in this context, data integrity and data security can be seen as related terms, each playing an important role in the successful achievement of the other. Thus, although data integrity can be seen as an arm of data security, the two are not necessarily the same. Data security can be seen as the protection of data against unauthorised access or corruption and as necessary to ensure data integrity.

Data integrity on the other hand, refers to the overall accuracy, completeness, and consistency of data throughout its lifecycle.[93] This is done so that data is safe and compliant with regulatory requirements, such as local privacy laws and those with international application such as the European Union's General Data Protection Regulation (GDPR).[94] Data that has been compromised is of little use to users and organisations alike. An ecosystem with strong data-integrity frameworks ensures that the data stored in the database will remain complete, accurate and reliable regardless of how long it is stored or how often it is accessed.[95] Therefore, whenever data is transferred or replicated, it should remain unchanged.[96]

Data integrity, from a regulatory perspective, depends on national cyber security policies and legislation. Likewise, the security of data (including integrity) does not depend on the physical location of the servers that host such data. Rather, it is a function of the normative rules – including norms, policies, regulations, laws and protocols (such as data standards and technical interfaces), and the implementation of technologies and security measures (such as encryption, firewalls and access controls) – that are put in

90 'What is Interoperability?'
91 AU: Data Policy Framework.
92 Ibid.
93 Talend: 'What is Data Integrity and Why Is It Important?'
94 GDPR: Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons regarding the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC.
95 Talend: 'What is Data Integrity and Why Is It Important?'
96 Brook B 'What is Data Integrity? Definition, Best Practices & More'.

place by public or private service providers in the way that they store, access, share and use the data.[97]

On the African continent, the cyber security and data-privacy landscape have arguably received the most attention across countries. While some countries have separated the two (cyber security and data protection/privacy), some have opted to address the two under one banner as the AU has done with the AU Convention on Cyber security and Personal Data Protection (Malabo Convention).[98] The Convention addresses personal data protection in Chapter 2 and lays out the objectives, scope, formalities for processing data before outlining the necessary institutional framework for a trusted and secure data environment. Sections 3 and 4 of Chapter 2 lay out the relevant obligations relating to personal data processing and data subjects' rights respectively. Chapter 3 on the other hand speaks to the promotion of cyber security and combatting cybercrime. It prescribes cyber security measures to be taken at national level and sets out offences (crimes) specific to information and communication technologies.

Elsewhere on the continent, in 2019, the AU hosted the Global Forum on Cyber Expertise (GFCE), drawing a multi-stakeholder community of more than 140 members and partners from all regions of the world, aiming to strengthen cyber capacity and expertise globally with the intention of leveraging an important global capacity development model for cyber security capacity-building on the continent.[99] In early 2021, the Economic Community of West African States (ECOWAS) adopted a regional strategy for cyber security. The regional body convened 15 African states and the Council of Europe to harmonise legislation on cybercrime and electronic evidence within the rule of law and with human rights safeguards.[100]

At national level, 15 African states have a national strategy on cyber security while three countries have draft legislation in progress.[101] For example, South Africa makes use of the Protection of Personal Information Act.[102] The POPIA promotes the protection of personal information processed by public and private bodies and introduces minimum requirements for the processing of personal information as well as outlining the rights of data subjects, regulating cross-border flow of personal data and introduces mandatory obligations to report and notify data-breach incidents, and imposes statutory penalties for violations of the law. The POPIA works alongside the Cybercrimes Act[103] which brings the country's cyber security legislation in line with global standards.

In Uganda, the Data Protection and Privacy Act,[104] and the Data Protection and Privacy Regulations,[105] govern data privacy and security. The Act guarantees the protection of privacy of the individual and of personal data by regulating the collection and processing of personal information. The Data Protection and Privacy Regulations, 2021

97 AU: Data Policy Framework.

98 AU: 'African Union Convention on cybersecurity and personal data protection'.

99 Institute for Global Change: 'Cybersecurity in Africa: What Should African Leaders Do to Strengthen the Digital Economy?'

100 Anaeto F 'Information and Communication Technology: ECOWAS Adopts a Regional Strategy for Cybersecurity and the Fight against Cybercrime'.

101 ITU: 'National Cybersecurity Strategies Repository'.

102 Act No. 4 of 2013 (POPIA).

103 Act No. 19 of 2020.

104 Act No. 9 of 2019.

105 Regulations, 2021.

(Regulations) were published and gazetted in March 2021 by the Minister of Information Communication Technology and National Guidance and are intended to implement the Act by prescribing for the necessary procedural requirements including the obligations on data collectors, data controllers, and data processors.

Zimbabwe on the other hand has the Cyber and Data Protection Act[106] which came into effect in December 2021. The object of this Act is 'to increase data protection in order to build confidence and trust in the secure use of information and communication technologies by data controllers, their representatives and data subjects.'[107] The Data Protection Act consolidates and amends several pieces of legislation that govern cyber security and data protection such as the Postal and Telecommunications Act,[108] Official Secrecy Act,[109] Criminal Law (Codification and Reform) Act[110] and the Interceptions of Communications Act.[111] In addition, the Act establishes a Data Protection Authority,[112] the Cyber security and Monitoring of Interception of Communications Centre[113] and a Cyber security Committee.

4.6 Conclusion: Africa's readiness to adopt artificial intelligence technologies

The current legislative and policy space in Africa seems to suggest that Africa, while justified for being optimistic about the adoption of AI, is not ready to fully adopt AI technologies, at least from a 'data readiness' point of view. Admittedly, law and policy are not the only fields that support the adoption and use of AI; however, it is paramount for both governments and citizens that the use of AI be complemented by systems which evoke confidence in its use. Such considerations include guaranteeing security, transparency and ethical use of AI.

At the current moment, and as is shown above, when it comes to data creation as a starting point, current laws do not encourage or foster a competitive environment. Where there is less competition, the prices of internet/broadband connectivity will in most cases, be high. The continent requires a combination of de-regulating and re-regulating. What this means is that governments must move away from the gatekeeping

106 Cap 12:07 Act 5 of 2021.
107 Ibid. See the Preamble.
108 Cap 12:05 Act 27 of 1975.
109 Cap 11:09 Act 6 of 2005.
110 Cap 09:23 Act 23 of 2004.
111 Cap 11:20 Act 6 of 2007.
112 POTRAZ is named as the Data Protection Authority (DPA). The functions of the DPA include establishing conditions for the lawful processing of data, issuing its opinion either of its own accord or at the request of any person with legitimate interest on any matter relating to the application of fundamental principles of the protection of privacy. However, this appointment has been met with criticism given that POTRAZ is also the telecom sector regulator.
113 This Centre has also been met with scepticism as it will be housed in the Office of the President. Many fear the potential human rights abuses that may flow from this directive as the same body is also now responsible for the issuing of interception of communications warrants. This gives the government legal grounds to monitor and intercept communications of targeted persons, who, believed reasonably or not, to be enemies of the State, especially political opponents.

model if Africa is to participate and emerge as a leader in the digital global economy. There is a need to re-imagine laws and policies that will open doors for new service providers who potentially hold the reigns to ground-breaking technologies that aid in the attainment of sustainable development on the continent. While it is also not guaranteed that the entrance of new service providers into the market will bring prices down, competitive value chains are known to drive down retail prices faster than those that are not. Additionally, while the high charges of data are largely frowned upon, often they are justified. Data costs tend to reflect the cost of operation, market scale and the intensity of competition. What this ultimately shows is that most African mobile broadband markets are too concentrated, with a few dominant players.

The gatekeeping theme carries on into how the movement of data is generally treated on the continent. The continent has had more of a preoccupation with the protection of personal data and the relevant states have made provisions in varying ways which require that data be processed and stored within their respective countries' borders. This may or may not, in the digital age, be a strategic issue. On the one hand, critics of remote data storage argue that by hosting their data outside their borders, African countries are ceding some of their political, economic and digital sovereignty. They also argue that, in addition to maintaining data sovereignty and control over their data, by investing in local data centres, this might have a ripple effect on improving Africa's connectivity as more continental and international players would step up to invest more in infrastructure. On the other hand, the proximity of cloud servers to locations where requests are coming from is a major consideration for businesses as the closer these servers are to customers, the lower the latency which in turn improves the quality of services.[114] Therefore, the localisation approach as a means of maintaining data control is not without merit. However, data-infrastructure development ought to be contextualised in consideration of environmental impacts, safety and security infrastructure, duplicated costs for local data communities, and overall costs.[115]

To fully harness the potential of AI in Africa, data must move freely within the continent. This is even more true for non-personal data. To this end, data-localisation requirements should be backed by data specificity. For example, Nigeria has already instituted certain forms of financial data localisation,[116] while Australia prescribes forms of health-data localisation etc.[117] This is an area in which specificity is important for both facilitating wider data flows and for clarity, which can help minimise the costs for local businesses and innovators and reduce the risks of unintended consequences.

When it comes to technology neutrality and interoperability, it is important to be able to access data for value creation, innovation, and the effective use of AI-driven

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114 Abubakar I 'Africa's Cloud Computing Industry is Set to Grow as Data Adoption Rises'.

115 AU: Data Policy Framework.

116 In Nigeria the Central Bank of Nigeria imposed a set of mandatory Guidelines on Point of Sale (POS) Card Acceptance Services in 2011, guideline 4.4.8 of which, e.g., indicates that 'all domestic transactions including but not limited to POS and ATM transactions in Nigeria must be switched using the services of a local switch and shall not under any circumstance be routed outside Nigeria for switching between Nigerian Issuers and Acquirers' see Beyleveld A 'Data Localisation in Kenya, Nigeria and South Africa: Regulatory Frameworks, Economic Implications and Foreign Direct Investment'.

117 S 77. My Health Records Act, 2012 <https://www.legislation.gov.au/Details/C2017C00313>. See also Key K 'Data Sovereignty in Australia Overview and Answers'.

technologies. When data is of poor quality or inconsistent, it limits the ability of companies and the public sector to share and analyse data that can provide economic and social value. In Africa, in general, only governments can store large amounts of data-subject data. A common issue is that most data is incomplete, and often conflicts across different sectors. Interoperability can help correct and streamline these datasets. As such, governments should prioritise open-data standards that allow more people to work on datasets, thereby reducing the margin for error. Data portability can be explored in terms of its ability to be moved between different systems and/or between different parts of a system. This means data subjects should be able to seamlessly move their data from one platform to another. This ensures that the text is legible and easy to understand as well as that data subjects are not locked into a single provider, in the process promoting competition and consumer choice.[118] Furthermore, where certain restrictions on processing are necessary, such restrictions need to be clearly articulated and limited, in order to not interfere with low-risk processing that might be increasingly central to the training of AI through large-scale data processing.[119]

On the front of data integrity through security, while it is evident that the continent is making strides in the spheres of data protection and cyber security, the rates of adoption and effectiveness are not nearly good enough. The fact that only 15 states out of 54 have developed a national cyber-security strategy or laws and that the Malabo Convention only came into force in 2023, ten years after it was promulgated, is telling of the general attitude that the continent has with the regulation of the digital world. This is particularly concerning given that the continent is home to potentially the largest free-trade area in the world. Worse still, studies show that Africa lacks the talent and resources to deal with its cyber security threats. Of a population of about 1.24 billion people, the estimated number of certified security professionals in 2018 was 7,000, representing one for every 177,000 people.[120] While some countries have understandably undertaken to push these protectionist agendas alone, the truth of the matter, from a developmental point of view, is that the vulnerabilities in one system, network, agency on the continent, affect all.

African leaders must redouble their efforts and devote more resources to cyber security initiatives that improve global infrastructure, awareness, and strategic commitments. They must also respond to concerns and/or reservations regarding the low number of countries ratifying digital policy tools such as the Malabo Convention. The AU and other African regional blocs must prioritise building cyber security capabilities from a technical and political perspective. Through these agencies, African countries should continue to work together and with possible external stakeholders to learn from peers and share best practices. Taken together, these actions will strengthen the continent's path to a desirable, viable, and cybersecure Africa, which will strengthen its position as a dynamic force in the global arena and international digital space.[121]

Thus, the area of data governance in Africa is in need of a number of interventions, some of which are detailed above. The keynote from this chapter is that there is a

118 AU: Data Policy Framework.

119 Ibid.

120 Adomako K et al. 'Assessing Cybersecurity Policy Effectiveness in Africa via a Cybersecurity Liability Index'.

121 Institute for Global Change: 'Cybersecurity in Africa: What Should African Leaders Do to Strengthen the Digital Economy?'

serious need to de-regulate and to re-regulate in order to better align the policy and legal space with the efficient use of AI technologies to promote AI-driven sustainable development on the continent. A lot of the impediments that currently exist are based on real but mostly unfounded sentiments. The continent is in dire need of a comprehensive continental framework to guide its AI strategy. Once the continent has set its priorities straight, and detailed action areas, it will be imperative to leverage all sectors that work closely with AI to promote and democratise it throughout the continent.

Important questions have also been raised about the ethical considerations that accompany the adoption of AI technologies. For instance, a paper by Gebru and Buolamwini showed how facial recognition software was less accurate in identifying women and people of colour than white men.[122] In a continent as unequal and historically prejudiced as Africa, it will be imperative that for AI to be contextually effective and free of biases, the use of locally generated data sets would have to be prioritised in the training of AI technologies. However, further examining these ethical considerations is beyond the scope of the present chapter. The most important intervention at the present moment will be to harmonise regulatory policies and laws with the AI strategy in order to avail data for the development and use of AI systems for AI-driven sustainable development. The continent is in a privileged position to catapult into the 4IR without necessarily having to industrialise at the level of the Third Industrial Revolution. If governments can successfully eliminate the challenges discussed above, AI can be a driver of growth, development, and democratisation.

4.7 References

Abubakar I 'Africa's Cloud Computing Industry is Set to Grow as Data Adoption Rises' TechCabal (29 May 2020) <https://techcabal.com/2020/05/29/africas-cloud-computing-industry-is-set-to-grow-as-data-adoption-rises/>.

Adomako K et al. 'Assessing Cybersecurity Policy Effectiveness in Africa via a Cybersecurity Liability Index' (2018) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3142296>.

Anaeto F 'Information and Communication Technology: ECOWAS Adopts a Regional Strategy for Cybersecurity and the Fight against Cybercrime' ECOWAS Parliament Website (20 January 2021) <https://parl.ecowas.int/information-and-communicationtechnology-ecowas-adopts-a-regional-strategy-for-cybersecurity-and-the-fight-against-cybercrime/>.

AU: 'African Union Convention on cybersecurity and personal data protection' (2014) *African Union: Addis Ababa, Ethiopia*.

AU: 'Agenda 2063 Report of the Commission on the African Union Agenda 2063 The Africa We Want in 2063' (2015) <https://au.int/en/agenda2063/overview> (accessed 18 August 2022).

AU: 'Agenda 2063 The Africa We Want: Background Note' <https://au.int/sites/default/files/documents/33126-doc-01_background_note.pdf>.

AU: Data Policy Framework (February 2022) <https://au.int/en/documents/20220728/au-data-policy-framework>.

122 Buolamwini J & Gebru T 'Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification' at 77–91.

AU: 'The Digital Transformation Strategy for Africa (2020–2030)' (2020) <https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030>.

AUDA-NEPAD: 'The African Union Artificial Intelligence Continental Strategy for Africa' <https://www.nepad.org/news/african-union-artificial-intelligence-continental-strategy-africa>.

'Barriers to Interoperability in Healthcare Information Exchange' <https://www. stoltenberg.com/pages/articles/2019/InteroperabilityBarriers.aspx>.

Belson D, Paseka T and Tome J 'How The Gambia lost access to the Internet for more than 8 hours' <https://blog.cloudflare.com/the-gambia-without-internet/>.

Beyleveld A 'Data Localisation in Kenya, Nigeria and South Africa: Regulatory Frameworks, Economic Implications and Foreign Direct Investment' (14 March 2022).

Bowman C 'Data Localization Laws: An Emerging Global Trend' (6 January 2017) <https://www.jurist.org/commentary/2017/01/courtney-bowman-data-localization/>.

Brook Chris 'What is Data Integrity? Definition, Best Practices & More' (Text *Digital Guardian* (13 August 2018) <https://digitalguardian.com/blog/what-data-integrity-data-protection-101>.

Buolamwini J & Gebru T 'Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification' Proceedings of the 1st Conference on Fairness, Accountability and Transparency (2018) <https://proceedings.mlr.press/v81/buolamwini 18a.html>.

Byrnes N 'As Goldman Embraces Automation, Even the Masters of the Universe Are Threatened' *MIT Technology Review* https://www.technologyreview.com /2017/02 /07/154141/as-goldman-embraces-automation-even-the-masters-of-the-universe-are-threatened/.

Cory N 'Cross-Border Data Flows: Where Are the Barriers, and What Do They Cost?' (Information Technology and Innovation Foundation, 1 May 2017).

Cory N and Dascoli L 'How Barriers to Cross-Border Data Flows Are Spreading Globally, What They Cost, and How to Address Them' (Information Technology and Innovation Foundation, 19 July 2021).

Data Guidance: 'Guidelines for Nigerian Content Development in Information and Communication Technology (ICT) (as amended August 2019)' (13 November 2019) <https://www.dataguidance.com/legal-research/guidelines-nigerian-content-development>.

Data Guidance: 'Law No. 2013-450 19 June 2013 on the Protection of Personal Data' (23 May 2017) <https://www.dataguidance.com/legal-research/law-no-2013-450-dated-june-19-2013-protection-personal-data>.

'Defining AI – One Hundred Year Study on Artificial Intelligence (AI100)' <https://ai100. stanford.edu/2016-report/section-i-what-artificial-intelligence/defining-ai>.

'The Gambia: Freedom on the Net 2021 Country Report' *Freedom House* <https://freedomhouse.org/country/gambia/freedom-net/2021>.

Gilbert P et al. 'North Africa Has World's Slowest Internet' *Connecting Africa* <http://www.connectingafrica.com/author.asp?section_id=761&doc_id=772098>.

Goralski MA and Tan TK 'Artificial Intelligence and Sustainable Development' (2020) 18 *The International Journal of Management Education* 100330.

GSMA: 'The State of Mobile Internet Connectivity 2021.'

Harari YN *Homo Deus: A Brief History of Tomorrow* (Random House, 2016).

Hare V 'What Is Interoperability and Why Is It Important?' <https://www.tokenex.com/blog/what-is-interoperability-and-why-is-it-important>.

'How Can Africa Monetise Big Data?' *African Business* (23 December 2020) <https://african.business/2020/12/technology-information/how-can-africa-monetise-big-data/>.

IFC: 'Artificial Intelligence in Emerging Markets: Opportunities, Trends, and Emerging Business Models' (2020).

Institute for Global Change 'Cybersecurity in Africa: What Should African Leaders Do to Strengthen the Digital Economy?' <https://institute.global/policy/how-rethink-cybersecurity-africa-strengthen-digital-economy>.

'ISO Standards' <https://www.iest.org/Standards-RPs/ISO-Standards>.

ITU: 'National Cybersecurity Strategies Repository' <https://www.itu.int:443/en/ITU-D/Cybersecurity/Pages/National-Strategies-repository.aspx>.

Key K 'Data Sovereignty In Australia – Overview and Answers' Swift Digital (4 January 2022) <https://www.swiftdigital.com.au/blog/data-sovereignty-australia/>.

Lohr S 'From Agriculture to Art – the A.I. Wave Sweeps *The New York Times* (21 October 2018) <https://www.nytimes.com/2018/10/21/business/from-agriculture -to-art-the-ai-wave-sweeps-in.html>.

Mitchell J 'African E-Connectivity Index 2021: The Final Frontier and a Huge Opportunity' *Investment Monitor* (10 November 2021) <https://www.investment monitor.ai/tech/africa-connectivity-index-2021>.

M-Kajy 'Orange – Orange Money' <https://www.orange.mg/orangemoney/orange-money-pour-les-particuliers/les-services-financiers/m-kajy/>.

MoMo Kash 'MTN Ivory Coast' <https://www.mtn.ci/momo-portefeuille-mobile/momo-kash/>.

POTRAZ: 'Public Fixed Telecommunication Services' *Postal and Telecommunications Regulatory Authority of Zimbabwe* <https://www.potraz.gov.zw/?page_id=855>.

Sachs JD *The Age of Sustainable Development* (Columbia University Press, 2015).

Safaricom 'M-Shwari' <https://www.safaricom.co.ke/personal/m-pesa/credit-and-savings/m-shwari>.

Shiohira K and Dale-Jones B 'Interoperable Data Ecosystems: An international review to inform a South African innovation' (JET Education Services and merSETA, Johannesburg, 2019).

Statista: 'Africa: Return on Investment in Telecom Sector 2019' <https://www.statista.com/statistics/1231889/return-on-investment-in-the-telecom-sector-in-africa/>.

Strusani Davide and Houngbonon Georges Vivien *The Role of Artificial Intelligence in Supporting Development in Emerging Markets* (IFC, Washington, DC 2019).

Swinhoe D 'Senegal to Migrate All Government Data and Applications to New Government Data Center' <https://www.datacenterdynamics.com/en/news/senegal-to-migrate-all-government-data-and-applications-to-new-government-data-center/>.

Talend: 'What is Data Integrity and Why Is It Important?' Talend – A Leader in Data Integration & Data Integrity <https://www.talend.com/resources/what-is-data-integrity/>.

Talend: '8 Ways to Reduce Data Integrity Risk' Talend – A Leader in Data Integration & Data Integrity <https://www.talend.com/resources/reduce-data-integrity-risk/>.

Vinuesa R, Azizpour H, Leite L et al. 'The Role of Artificial Intelligence in Achieving the Sustainable Development Goals' (Nature Communications, 2020).

'What is Interoperability?' Definition and FAQs – HEAVY.AI <https://www.heavy.ai/technical-glossary/interoperability>.

World Bank: 'Creating Value in the Data Economy: The Role of Competition, Trade, and Tax Policy' *World Development Report 2021: Data for Better Lives*.

World Bank: 'Data Protection and Privacy Laws – Identification for Development' <https://id4d.worldbank.org/guide/data-protection-and-privacy-laws>.

World Bank: Open Knowledge <https://openknowledge.worldbank.org/bitstream/handle/10986/34139/9781464815591.pdf>.

Chapter 5

The possible future of African democracy in the age of artificial intelligence

5.1 Introduction

The introduction of technology in political processes has both undermined and strengthened democracy.[1] Artificial intelligence (AI) is a form of technology which is being rolled out around the globe as part of the digital revolution and is impacting on different facets of human life in different ways. This chapter discusses the potential impact of AI on democracy in Africa. The term AI has multiple meanings which have been attached to it.[2] For purposes of this chapter, AI is used as an umbrella term to describe 'the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision.'[3] These applications can process huge amounts of data and learn by example as if they were humans.

In this chapter, democracy refers to a political system of governance that is based on the will of the people, as well as on values such as popular participation, respect for human rights, transparency and government accountability.[4] The introduction of AI in political processes is still an unfolding process. In some parts of the world, the deployment of AI in political processes, including elections and public policy consultations has reached an advanced stage as is shown in this chapter. In Africa, very little is known about the extent to which AI is involved or has been deployed in political processes. This is mainly because the process of procuring and deploying this technology is opaque and is still at nascent stages. The aim of this chapter is to begin the conversation on the potential impact of AI on democracy in Africa. However, the discussion in this paper is restricted to the impact which AI is projected to have on democratic processes (including elections) and democratic values such as human rights. The chapter tackles this subject by providing an overview on the global trends on the use of AI in political processes, and the impact which such technology is having on democratic processes and democratic rights. Based on the anecdotal information available in Africa, this chapter makes an indicative assessment on the potential impact of AI on democracy in Africa. For example, the chapter examines the role of social media as a

1 Risse M 'Artificial Intelligence and the Past, Present, and Future of Democracy'.
2 See Martin-Bariteau F & Scassa T (eds) *Artificial Intelligence and the Law in Canada* at 3.
3 Ibid. See also Tucci L et al. 'A guide to artificial intelligence in the enterprise'; Cofone IN 'AI and Judicial Decision- at 3. We also adopt the definition of AI in Schippers B 'Artificial Intelligence and Democratic Politics' at 32: 'an umbrella term that refers to a series of general purpose and diverse technologies, which are propelled by computational power, and which build on methods in fields such as machine learning to advance automated and increasingly autonomous decision making and actions'.
4 Universal Declaration of Human Rights, 1948 art. 21.

key platform and vehicle through which AI is being deployed across the world, including on the African continent.[5] Various algorithms have been developed and deployed on Facebook (now Meta), Instagram and Twitter (now X) to read and collect personal data on the way human beings think, feel and their preferences. Using such personal data, these algorithms can be used to amplify certain types of content as part of targeted advertising. In a similar fashion, the algorithms can also be used to promote certain political narratives to influence voting patterns in elections and other democratic processes in Africa, as has been done elsewhere.[6] The chapter also discusses the use of facial-recognition technologies[7] installed in public places as part of state surveillance, and how this is impacting on democracy and human rights.

However, the assessment provided in this chapter is not conclusive because of the very limited published information and data on this subject. The chapter concludes with some broad recommendations on what needs to be done to ensure that the continued roll out of AI in political processes in Africa will enhance rather than undermine democracy.

5.2 Global trends on the relationship between artificial intelligence and democracy

In 1890 Warren and Brandeis projected that collection of personal information was 'no longer the resource of the idle and of the vicious, but has become a trade, which is pursued with industry as well as effrontery'.[8] Warren and Brandeis accurately foretold unfolding developments impacting democratic regimes and democratic practices. The collection of personal information drives the informational and technological revolution, and AI application.[9]

Technology 'amplifies human frailties and magnify[ies] malign human intent'[10] and therefore, can advance or undermine democracy. Governments are formed from electoral democracy or electoral authoritarianism, including digital electoral authoritarianism.[11] The intention behind introducing technology often determines the outcome or the impact of technology. AI has been 'heralded as invaluable instruments of democratic action',[12] while authoritarian regimes and complicit private sector have used AI technologies to erode democracy, including by violating individual autonomy. At the heart of democracy is individual autonomy in decision-making,[13] while for AI, automation is the key – giving rise to concerns of manipulation of the will of the people.

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5 See 'What is artificial intelligence for social media?'
6 E.g., Facebook algorithms were used during the 2016 US election. See ABC News: 'Facebook's oversight board: Watchdog or distraction?'
7 Such as those installed by Cloudwalk Technologies and Hikvision in Zimbabwe under the Smart Cities Program. See ADF: 'Zimbabwe turns to Chinese technology to expand surveillance of citizens'.
8 Warren SD & Brandeis LD 'The Right to Privacy' at 193–220. See also Cooley A 'The right to be let alone' at 29, which was popularised in the seminal article by Warren & Brandeis.
9 Hervé A 'Data Protection and Artificial Intelligence: The European Union's Internal Approach and Its Promotion through Trade Agreements' at 193–214.
10 Schedler A 'The Menu of Manipulation' at 37–50.
11 Pew Research Center: 'The Future of Digital Spaces and Their Role in Democracy'.
12 Kamarck E 'Malevolent soft power, AI, and the threat to democracy'.
13 Pendlebury M 'Individual Autonomy and Global Democracy' at 43–58.

If electoral processes are AI manipulated, can their outcome be properly classified as an expression of the will of the people? This is a major question for democracies across the globe. AI as a general-purpose technology can be used for undemocratic purposes, such as undermining citizen participation through misinformation, disinformation, and voter suppression.[14] With advances toward stronger AI levels, artificial general intelligence (AGI) technological applications will assume a higher level of influence in decision-making, reducing the role of human autonomy in those decision-making processes. This advanced automation raises power imbalances and undermines decisional autonomy.[15] Of course human democratic decision making is yet to shift to technology.[16] That notwithstanding, the deployment of AI in democratic processes and ordinary human affairs has sometimes created an 'illusion of complementarity'.[17]

Citizen autonomy in participation and decision making are critical facets of democracy. Democratic practices face alteration through 'AI-enabled manipulation'.[18] This is the imposition of hidden influence on individual decision making. This manipulation portends for 'artificial personhood'.[19] This fuels concern of machine-augmented decisions, reducing human autonomy. AI gives options that feel human, though they actually are not.[20] AI application decisions are not neutral. The constellated application of technology has massive potential to undermine the foundational tenets of democracy accentuating the dangers of AI in democracy. To reach a stage where AI rationality replaces human rationality, means that such technology must be accountable and can be entrusted with the making of democratic decisions. To sum it up, there are contradictions of AI and democracy, as much as there are challenges and opportunities.

The emergence of information databases spurred technology development. In 1972, a United States Department of Health, Education and Welfare (HEW) study observed that a three-year-old medical database of 14,000 patients had amassed over 50 million data characters, approximately 3,500 characters per patient-record.[21] This database could be repurposed to influence political decisions.[22] For example, it could be used by private actors to inform the design of their political campaign strategies, including framing election-campaign messages that are targeted at swaying the voting preferences of particular population groups. Today, informational databases holding public data are often privately owned, and more likely to advance techno-capitalism agendas than democracy. Private actors have become the major decision makers in 'democratic processes' through their control of big data, quantum computing, and data-analytics

14 Peters K 'Technology to Invite, Inform, and Modernize: How Platforms Support Democratic Participation' at 429.

15 Deibel T 'Back to (for) the Future: AI and The Dualism of Persona and Res in Roman'.

16 Harari YN *Homo Deus A Brief History of Tomorrow* cited in Hankey S, Morrison JK and Naik R *Data and Democracy in the Digital Age*.

17 David M 'AI and the Illusion of Human-Algorithm Complementarity' at 887–908.

18 Susser D, Roessler B and Nissenbaum H 'Online Manipulation: Hidden Influences in a Digital World' at 26.

19 Karanasiou A and Pinotsis D 'Towards a legal definition of machine intelligence: the argument for artificial personhood in the age of deep learning' at 119–128.

20 Helbing D et al. 'Will Democracy Survive Bid Data and Artificial Intelligence?'

21 USA Department of Health, Education and Welfare Records: Computers and the Rights of Citizens: Report of the Secretary's Advisory Committee on Automated Personal Data Systems at 24–25.

22 Eubanks V *Automating Inequality: How High-Tech Tools Profile, Police and Punish the Poor*.

capabilities. In the US, the use of technology in elections can be traced as far back as the 1992 and 1996 Clinton campaigns.[23]

With each election since then, the use of technology has advanced with both negative and positive impact. During the 2008 US election, the Obama campaign raised over $500 million through technology or internet-enabled platforms. In 2012, the Obama campaign relied on Facebook to collect personal information to assist in voter mobilisation.[24] Back then, Obama had 23 million active Facebook followers.[25] The Facebook Connect interface collected personal data from these followers, including age, postal address, occupation, voting history and email addresses. What's more, such data was also collected from acquaintances of the followers.[26] Facebook profiles have several data points, allowing for behavioural analytics and profiling. These data points enabled targeted campaigning and political marketing.[27] Through the use of algorithms, the campaign team was able to interpret the data, and made decisions recommending the most utility approach for increasing voter registration and voter turnout on election day.[28]

AI-related technology played a more significant role in the 2016 US elections. Using algorithmic-automated data, Cambridge Analytica deceptively gathered data sets of 270,000 individuals to generate data of 50 million Facebook users.[29] Based on the 270,000 individuals personality tests, at least 200 friends of each contact were added to the data set without their consent These individual profiles were crossmatched to voter rolls in 11 US States, representing a quarter of the voting population. The AI analytical tools identified swing voters and crafted personality-determined campaign messages. This was perceived as superior election organising. However, one might argue that in essence this undermined democratic agency. The results from these elections were driven by manipulated frames. This is becoming common in electoral and democratic processes. For instance, Cambridge Analytica allegedly engaged in voter-manipulation practices in the 2017 Kenyan elections,[30] while other social media platforms and instant messaging platforms like WhatsApp are reported to have manipulated voting preferences in the 2018 Brazilian elections.[31] Manipulation of elections predates the introduction of AI, but the AI-enabled 'nudging of voters' with specialised information increases the likelihood of a different electoral outcome.

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23 Owen D & Davis R 'Presidential Communication in the Internet Era' at 661.

24 There were questions of whether it was ethical or moral, as the legality (consent and lawfulness) was solved by a Facebook user logging onto their campaign website using their Facebook login details.

25 These numbers have grown to 55 million as at January 2022, making Obama the most followed politician; followed by Prime Minister Narendra Modi of India with 44 million.

26 'Obama, Facebook and the power of friendship: the 2012 data election'.

27 '98 personal data points that Facebook uses to target ads to you'.

28 This is a paraphrased definition of AI in Samoili S et al. 'Defining Artificial Intelligence. Towards an operational definition and taxonomy of artificial intelligence'. See also Issenberg S 'How President Obama's campaign used big data to rally individual voters' at 38–49.

29 'Cambridge analytica Facebook influence US election' *The Guardian* (17 March 2018).

30 'How Cambridge analytica poisoned Kenya's democracy'. See also 'Cambridge analytica and its role in Kenya'.

31 'Whatsapp skewed Brazilian election showing social media's danger to-democracy'. See also 'Whatsapp fake news Brazilian election'.

Technology experts have raised accountability and transparency concerns over the introduction of AI in democratic processes.[32] At the centre of AI interference with electoral and democratic practices is 'psychographic profiling' of voters, as exemplified in the 2016 US elections described above.[33] These new forms of political campaigning and voter mobilisation are manipulative of democratic processes and elections. AI tools exponentially increase 'digital deception' and 'digital coercion' of voters through optimised information from psychological profiling. That said, accurately measuring the societal and political impact of AI generated disinformation remains contested. This is a black box challenge to democratic institutions and ethos, however personal autonomy in decision making is undermined.[34] As Hu observed 'law and policy must now evolve to encompass newly emerging harms posed by black boxing the voter' and transparency, access to data sets, and impact assessment is necessary.[35]

Through a national policy that has had profound impact on democratic rights at home and abroad, China has amplified efforts to be an AI global leader by 2030.[36] The Chinese technology and AI policy rests on digital sovereignty[37] and encourages data localisation enabling more stringent and effective controls over access and transfer of personal data.[38] Because of data sovereignty,[39] China has unmitigated access to personal data held by private and public entities. Through a vast network of AI-enabled surveillance cameras, Chinese authorities are collecting enormous amounts of data, which in turn is easily cross referenced with other datasets.[40] Cooperating private companies are given preferential treatment for government contracts.[41]

China is reported to have introduced a social credit system which involves the monitoring and scrutinising of citizen behaviour and conduct (including online expressions) and citizens are scored and ranked according to rules set by the government.[42] According to this system, those with high ratings are supposed to accrue certain privileges including reduced bus fares, while those with low scores may lose certain rights and be blacklisted.[43] Under this system, citizen scoring is mainly done through a process that

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32 Pew Research Centre: 'Many tech experts say digital disruption will hurt democracy'.
33 Susser, Roessler and Nissenbaum at 11.
34 Hu M 'Cambridge Analytica's black box' Big Data & Society (2020).
35 Ibid.
36 OECD: 'Policy initiatives'.
37 This refers to a country's ability to act independently in the digital world and includes approaches intended to advance cooperation or uptake of its policies and practices furthering trans-national digital sovereignty.
38 Liu J 'China's data localization' at 84–103. Companies such as Huawei have faced coordinated international resistance and denial of business opportunities due to privacy surveillance. This approach is viewed as pragmatic in response to external environment, and pursuit of internet sovereignty leading to building of 'data dam' for purposes of security, economy, and technology development.
39 Data sovereignty means that data is subject to the laws and regulations of the country or location where that data is collected, and that data, especially sensitive data, must remain within the country's borders. The idea is for data to remain under the owner's control. African governments, including South Africa, are motivating for data sovereignty. See 'Government data must stay in South Africa says state technology executive'.
40 Andersen R 'The Panopticon is already here'.
41 Jing M and Dai S 'China recruits Baidu, Alibaba and Tencent to AI "national team"'.
42 Maxwell E 'China ranks "good" and "bad" citizens with "social credit" system'.
43 Ibid.

involves online surveillance and gathering of various kinds of personal data, and the assessment of such data using certain algorithms that are administered by government.[44] Although the Chinese government has denied setting up such a system, some have argued that the system was piloted in certain cities around the country before being aborted as government preferred other forms of surveillance.[45] It is reported, for example, that the city of Suining implemented the system and would deduct points for citizens who organise or take part in government petitions and who make online comments against government.[46] In 2016, the (Chinese) State Council issued a statement[47] indicating that it would explore the establishment of a personal integrity score management system across the country. Whatever the case may be (regarding the status of the Chinese social credit system), the fact that such a system was once introduced (or attempts were made to introduce it) shows that AI may potentially be used by repressive governments to undermine the right to privacy, with chilling effects on related democratic freedoms including the freedom of expression and the freedom of individuals to call government to account in China and in foreign countries that are under Chinese influence.

Notwithstanding these potential challenges, the introduction of AI in democratic decision-making processes has also had some reported positive impact. For example, on the global stage, Taiwan has been hailed as a successful story for digital democracy.[48] In 2022 Taiwan was the only Asian country reported as having open offline and online civic spaces, allowing for effective citizen participation.[49] In Taiwan, AI technologies are seen as a 'consensus-generating mechanism'.[50] Citizens' views are collated on platforms and moderated. Algorithms discourage echo-chambers[51] by displaying the various attitudes and ideas without creating opportunities for harmful conduct such as trolling or hateful speech. Modern societies require 'capacity for both reflexive autonomy' that manages and mitigates against 'dominant views'; yet allowing for citizen participation in deliberative processes.[52] Technology companies, citizens and the Taiwan government have collaborated to advance democratic practices. Through AI applications, the Taiwan government collected information on various issues resulting in people-driven regulations and practices.[53] The use of AI applications to collect citizens' views increased popular participation, and gathering of views which would have taken considerable resources and efforts to consult over 23 million people.[54] Online

44 'Will Democracy Survive Big Data and Artificial Intelligence?'.
45 'China's social credit score untangling myth reality'.
46 Ibid.
47 Brussee V 'China's Social Credit Score – Untangling Myth from Reality'.
48 'What the World Can Learn From Taiwan's Digital Democracy'.
49 See CIVICUS: 'Civic Space Monitor'.
50 'Taiwan is making democracy work again. It's time we paid attention'.
51 Danger with echo-chambers is that it increases social polarisation, resulting in toxic polarity and groups of society failing to understand each other and translating these differences into conflict as seen with the Trump-inspired and failed storming of the US Capitol in January 2021.
52 Rouvroy A and Poullet Y 'The Right to Informational Self-Determination and the Value of Self-Development: Reassessing the Importance of Privacy for Democracy.'
53 According to Taiwan Digital Minister, Taiwan's national participation platform has hosted 10.6 million unique visitors – almost half of Taiwan's population – since its launch in 2015. Anyone can begin an e-petition on the platform. Once a case has 5,000 signatures, the relevant ministries must respond in public. See CIVICUS: 'Tag Taiwan'.
54 Ibid.

collaboration has advanced accountability in complex matters such as budgeting and policy development, improving efficiency in decision-making processes.

5.3 The impact of artificial intelligence on African democracy: What do we know so far?

The introduction of AI in African democratic processes is opaque and generally not yet fully fledged, making it difficult to adequately and comprehensively assess the impact of this technology. However, there have been some notable case studies on how AI has been used on the continent to impact on democratic processes and rights. African governments are net importers of AI technologies, especially from China,[55] Israel,[56] India, the United States and Europe. There are indications, as is shown in the paragraphs below, that Africa is also used as a testing ground for some of the technologies.

For instance, recently in 2020, the government of Zimbabwe is reported to have signed agreements with Cloudwalk Technologies and Hikvision (both Chinese companies) to install facial recognition technology in public spaces.[57] Zimbabwe is the proving ground that will train the system to identify faces of people with dark complexions, something AI has difficulty doing.[58] During the 2015 Nigerian elections, reports indicated that Cambridge Analytica deployed its AI-driven data analysis technology as dry run before using it in the 2016 US elections.[59] The firm is reported to have been hired by a Nigerian billionaire who was scared of losing oil exploration contracts if there was going to be a possible change of government.[60] Cambridge Analytica's mission was to support the 2015 re-election campaign of the former President of Nigeria, Goodluck Jonathan, and de-campaign the then opposition candidate, Muhammadu Buhari. Using hacked private and personal information of Muhammadu Buhari, Cambridge Analytica was reported to rely on AI-embedded social media (algorithms on Facebook) to identify and target online supporters of the opposition with such negative information as part of an effort to sway the voting preferences in favour of the re-election of President Goodluck Jonathan.[61]

During an investigation into the conduct of Cambridge Analytica, a whistle-blower said:

> 'Everything the company did after the Mercers got involved [in Nigeria's 2015 elections] was about refining a set of techniques that they would go on to use in the US elections [in 2016]. These campaigns in other countries were experiments. They worked out how to harvest data and weaponize it. And they got steadily better at it.'[62]

Outside of elections, African countries are also importing AI technologies purportedly to assist in maintaining public order and security. For example, Zimbabwe, Uganda and South Africa are implementing smart city surveillance systems which are intended

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55 Feldstein S 'The Global Expansion of AI Surveillance'.
56 See, e.g., The Pegasus technology purchased by authoritarian governments from an Israeli security company NSO Group.
57 See ADF: 'Zimbabwe turns to Chinese technology to expand surveillance of citizens'
58 Ibid.
59 'Cambridge analyticas ruthless bid to sway the vote in Nigeria'.
60 Ibid.
61 Ibid.
62 Ibid.

to improve service delivery, but with limited to no accountability despite collecting massive personal information.[63] The use of such surveillance is not transparent, further making it difficult for affected individuals to hold public authorities accountable for any human rights violations which may arise.[64] The smart city surveillance infrastructure collects data which can also be used to conduct surveillance of democratic and legitimate opposition, thereby undermining democratic activities. Uganda and Zimbabwe are among countries where the abuse of AI smart city surveillance tools has been reported, with concerns that the technology will be used to spy on the opposition and civil society and suppress legitimate democratic action such as mass protests.[65] For instance, as part of the five-year, $100 million Smart Cities project with Huawei, closed-circuit television (CCTV) cameras have been installed in Harare and Bulawayo with a focus on major streets and locations popular with anti-government protesters.[66] Through AI-enabled machine reading and learning capabilities, the images collected through the CCTV cameras can be linked to other government-controlled databases and can identify and track down protesters.

South Africa has also procured and deployed AI tools to encourage public participation in governance matters. For example, an AI application, GovChat, was deployed in 2018 to encourage citizen participation in local governance and engagement with elected local councillors.[67] The GovChat is a messaging platform connected with popular instant messaging platforms such as Facebook Messenger, short messaging service (SMS), WhatsApp and USSD.[68.] It allows for interactive engagement between residents and local authorities. Through GovChat citizens can log a service-delivery request, and the system's AI enabled capabilities are supposed to automatically escalate the request to the relevant ward councillor. During the launch of GovChat, the South African government suggested that 'citizens will be able to access over 10,000 public representatives supporting over 30,000 public facilities and services in communities across the country'.[69]

In Kenya in 2018 the government deployed the National Integrated Identity Management System (NIIMS). The NIIMS was designed to be a central digital identity registry, and the singular and primary source of personal information of all citizens and residents. The personal information would be contained in an NIIMS database, and individuals would be allocated a unique and permanent digital identifier. The development of the digital identity has many risks. The High Court[70] reprimanded the Kenya government for embarking on this exercise without putting in place effective data-privacy

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63 See, e.g., the following reports: 'Uganda uses China's Huawei facial recognition to snare protesters'; 'China is exporting facial recognition to Africa ensuring AI dominance through diversity'.

64 Mudongo O: 'Africa's Expansion of AI Surveillance – Regional Gaps and Key Trends'.

65 See 'Uganda uses China's Huawei facial recognition to snare protesters'; 'China is exporting facial recognition to Africa ensuring AI dominance through diversity'.

66 ADF: 'Zimbabwe turns to Chinese technology to expand surveillance of citizens'.

67 Human Sciences Research Council: 'AI technologies for responsive local government in South Africa'.

68 'Unstructured Supplementary Service Data' is the technology for short texting instructions between a mobile phone device and another application program in the network.

69 Deputy Minister Andries Nel: 'Launch of GovChat'.

70 *Nubian Rights Forum & 2 others v Attorney General & 6 others; Child Welfare Society & 9 others (Interested Parties)* [2020] eKLR Petition 56, 58 & 59 of 2019.

safeguards. The proposed collection of DNA and GPS coordinates was also ruled by the Court to be disproportionately intrusive.[71] The Kenyan High Courts further observed that NIIMS had a 'high risk of excluding an entire segment of the Kenyan population and this could affect people lacking documentation, people facing hurdles with biometrics'.[72]

The collection of biometrics and issuance of digital identities is gaining popularity on the African continent. For instance, Zimbabwe used the Biometric Voter Registration system in the 2018 elections. Instead of the old registration in which potential voters presented their national cards, biometric information fingers, images and cell phones numbers were collected. This system was abused by the governing party to obtain personal voter information which was used to send targeted campaign messages via SMSs, without the recipients' consent.[73] Armed with such vast databases of personal information, there are concerns that the government may be using the information to aid online surveillance targeting political dissenters, using algorithms that are designed to identify and track those who make online comments against the government.[74]

5.4 Potential future implications of artificial intelligence on democracy in Africa

As highlighted above, AI has begun to make its way into Africa, but we have not yet seen its deployment being done at a full scale. The roll out of AI is an ongoing process and in the not-so-distant future, we are likely to see a greater impact of this technology in democratic political processes. What is it that is likely to shape the nature of the impact which AI will have on democratic political processes in Africa?

It is important to ensure that AI and any other related technology interventions promote rather than undermine democratic processes and freedoms, including the right to participate and the right to make free choices, and the right to privacy and freedom of expression both online and offline. Whether AI will have a negative or positive impact on the quest for democracy in Africa will depend on whether there is any independent oversight mechanism in place to enforce international accountability standards[75] on the development and use of AI, the level of technical capacity of African governments to control and regulate the use of AI within their jurisdictions, the nature of the political state in Africa and the level of access to AI enjoyed by the majority of the people in Africa. Thus, for us to gain an insight into whether AI will be an ally of democracy or autocracy in Africa, we need to look at whether Africans have any means to hold technology companies accountable to international ethical standards and rules on the use of AI. We also need to reflect on the political nature of the State in Africa and examine whether the nature of governments that are prevalent on the continent would be willed towards using AI to promote democracy or to strengthen autocratic hegemony. We must also reflect on whether this technology would be accessible to

71 Ibid.
72 Ibid. See also 'Roll-out of Huduma card is unlawful judge rules'.
73 'Lawyer drags zec zanu pf econet to court'.
74 See Mudongo O.
75 Such standards need to be developed as part of international consensus on the development and use of AI. They must be derived from existing international human rights law and, therefore, they should include respect for all fundamental rights.

most of the people to further their democratic aspirations. These questions are discussed in the paragraphs below.

5.4.1 *Absence of an independent oversight mechanism*

There is no democratic independent control or regulation of the design, deployment, and use of AI. As is the case with various other forms of technology, AI is designed and deployed by private technology companies who are not accountable to any independent oversight regulatory body. Currently, there is no international oversight body that has been established to monitor and enforce relevant legal standards on the development and deployment of AI. This renders the use of AI vulnerable to manipulation and abuse by private technology companies and other players.

For example, social media is a key platform and vehicle through which AI is being deployed across the world, including on the African continent.[76] As indicated earlier in this chapter, various algorithms have been developed and deployed on Facebook, Instagram and X to read and collect personal data on the way human beings think, feel and their preferences. Using such personal data, these algorithms are used to amplify certain types of content as part of targeted advertising. In a similar fashion, these algorithms can also be used to promote certain political narratives to influence voting patterns in elections and other democratic processes in Africa, as was witnessed in the 2016 US election.[77] Therefore, in the absence of an independent regulatory mechanism which provides oversight on these companies and enforce ethical standards, it is possible for social-media companies and anyone who controls the deployment of AI on social media to manipulate voting patterns and undermine electoral democracy, as we have already witnessed.

Furthermore, sophisticated algorithms have been developed to moderate content on social media platforms. In other words, algorithms have been developed to moderate freedom of expression online. For example, Facebook and X use content moderation algorithms to detect and take down posts and social-media accounts found to be engaging in conduct which violates the platform's rules. This includes posts and social-media accounts which spread misinformation. However, there is no guarantee of fairness in the way these algorithms operate, particularly in deciding which content to remove and which content to spare. For example, a few days before the 2021 general election in Uganda, Facebook removed hundreds of accounts associated with President Yoweri Museveni, ostensibly for engaging in practices tantamount to manipulating voters.[78] Similarly, social media accounts affiliated to the then President Magufuli were taken down in Tanzania. While some of the accounts were indeed spreading misinformation, the opposition groups also had their own accounts or accounts affiliated to them which were spreading misinformation but were not taken down.[79] This raises the concern that there is selective application of rules by the social media companies through these algorithms in favour of certain preferred election candidates. Although some social-media companies, including Meta-Facebook, have established an oversight board with the mandate to oversee decisions to remove social media accounts and information from their platforms, the independence of these mechanisms remain

76 See 'What-is-artificial-intelligence-for-social-media?'
77 ABC News: 'Facebook's oversight board: Watchdog or distraction?'
78 'Uganda elections 2021: Facebook shuts government-linked accounts'
79 Ibid.

questionable, partly because the appointment of the members of the oversight board was done by Meta-Facebook itself. In the absence of a genuinely independent regulatory body who oversees content moderation, there is no guarantee that content moderation algorithms will not be selectively applied and or manipulated by social media companies to amplify certain voices during democratic processes such as elections. This risk is even greater considering that the management of these companies can be manipulated and pressured to align with certain political interests. For instance, in 2021, Meta-Facebook was reported to have been pressured by the Vietnamese government to censor anti-government content or risk being banned from operating in the country.[80] Meta-Facebook is reported to have complied with the government's demands and increased censorship of anti-government content ahead of the Vietnam's party congress in January 2021. An independent international mechanism, along the lines of the International Telecommunications Union (ITU) would help a great deal to facilitate accountability at a global level. Alternatively, considerations may be made to expand the mandate of the ITU so that it can address these issues.

5.4.2 *Limited technical capacity to manage and control artificial intelligence systems*

Generally, African institutions lack adequate technical capacity to install and manage digital technology. They heavily rely on external private companies and governments, mainly from the US and China for the installation and maintenance of these technologies.[81] This renders African democratic processes vulnerable to manipulation through external influences. For example, several governments (including Kenya, Tanzania and Uganda[82]) have acquired the services of Huawei, to roll out the safe cities surveillance program. This program involves the use of video technology combined with AI-enabled facial and voice recognition technology, ostensibly to fight crime and terrorism. In 2015, Zambia launched its Smart Zambia Initiative, a program that is aimed at mainstreaming ICTs in the administration and operations of the public service, networking government departments to ensure data sharing and creating a cloud-based national data centre.[83]

A common feature of all these initiatives is that they are implemented, managed, and maintained by external private technology companies working in collaboration with their domestic governments. For example, the Smart Zambia Initiative was financed by the Chinese government and was installed by Huawei, a Chinese company.[84] Similarly, the safe cities program in Uganda was installed and is managed and maintained by Huawei.[85] Although this technology may be used to promote efficiency in the provision of governmental services and to combat crime and terrorism, the fact that it is maintained and managed by external forces creates room for it to be used by those

80 'Mark Zuckerberg Facebook whistleblower'.

81 See 'Uganda uses China's huawei facial recognition to snare protesters'; 'China is exporting facial recognition to Africa ensuring AI dominance through diversity'.

82 See 'Huawei technicians helped African governments spy on political opponents'. See also Jili B 'Surveillance Technology a Concern for many in Africa'.

83 'Ministerial Statement on Progress of the Smart Zambia Initiative'.

84 Chiumbu S 'Chinese Digital Infrastructure, Smart Cities and Surveillance in Zambia'.

85 See 'Uganda uses China's huawei facial recognition to snare protesters'; 'China is exporting facial recognition to Africa ensuring AI dominance through diversity'.

forces to undermine certain democratic rights, processes and values. Already, there are a few incidents which point towards that.

For example, in 2012 China assisted the African Union (AU) in building the AU headquarters in Addis Ababa and was responsible for the installation and maintenance of the digital security system of the building.[86] In 2020 a Chinese firm was found to have been hacking the security servers and cameras at the building and syphoning data to its headquarters in China.[87] This was alleged to be part of a Chinese government surveillance process of gathering intelligence on the confidential deliberations among African leaders and the data gathered from this process would be used (or is being used) to inform China's engagement with various leaders and governments on the continent. In addition to managing the digital infrastructure at the AU headquarters, so far Chinese companies are reported to have built at least 186 government buildings in Africa and installed 14 sensitive intragovernmental telecommunications networks.[88]

Another example is that, in the aftermath of the 9/11 attacks the United States of America's National Security Agency is reported to have assisted the Ethiopian government to establish a sophisticated multifaceted surveillance system to be used to combat terrorism,[89] particularly to strengthen Ethiopia's fight against Islamist militant groups who include Al Shabab. However, the surveillance system has reportedly[90] been used by both the government of Ethiopia and the US intelligence beyond the prior agreed scope, resulting in violations of a wide range of democratic rights and freedoms. Reportedly, this system involves, among other capabilities, the use of video technology combined with AI-enabled facial and voice recognition technology.[91]

These examples demonstrate that digital AI installations in Africa, by external private corporations, may have become pathways for intelligence gathering by foreign governments. The intelligence is gathered in ways which undermine democratic freedoms and may be used to undermine democracy in future, including promotion of political leaders who are malleable to foreign interests. This is partly because most African governments do not have adequate technical capacity to manage and control the use of these technologies once they have been installed in their jurisdictions.

5.4.3 *The undemocratic nature of the political state in Africa*

Political will is another huge factor which determines how technology, including AI, will be used. Africa is currently dominated by autocratic governments.[92] In recent years, the continent has witnessed serious democratic regression.[93] For example, democracy backslided in more than 17 countries in Africa since 2018.[94] As indicated above, governments are the major procurers of AI on the continent. Even though AI is capable of advancing democracy and human rights, most autocratic governments are interested

86 'Suspected Chinese hackers stole camera footage from African Union memo ID'.
87 'China_experts report China hacking African Union HQ fits larger pattern'.
88 Ibid.
89 Turse N 'How the NSA Built A Secret Surveillance Network for Ethiopia'.
90 Ibid.
91 Ibid.
92 See Freedom in the World 2021: Democracy under Siege'.
93 See Enonchong, L-S, Fokala E and Abebe AK (eds) *Democracy in Africa: Regression and Resilience*.
94 Ibid.

in strengthening their hegemony rather than advancing democracy. They tend to use technology, including AI to subvert democracy. There are already a few examples that point towards what we have discussed in the sections above, including in Uganda, Zambia, Zimbabwe and Ethiopia.

Various forms of AI-related technologies and expertise are being used to suppress freedom of expression and the right of access to information by governmental authorities. For instance, in 2020 Egyptian government authorities were reported to have used Sandvine devices to block 600 websites and conduct surveillance on internet users through deep packet inspection (DPI) technology.[95] In 2020, Rwandan authorities are reported to have used Pegasus spyware to target for surveillance over 3,500 phone numbers linked to Rwandan political activists, journalists, and politicians. The Tanzanian government is reported to have been working with Hacking Team – a firm that provides electronic surveillance capacity – and signed with the South Korean and Israeli governments cyber security collaboration agreements, which has been used to conduct surveillance on political opponents.[96] Zimbabwe is reported to have been engaging in similar acts of surveillance.[97]

5.5 Conclusion and recommendations

The introduction of technology, including AI, holds great prospects for enhancing civic participation and increasing transparency in democratic processes. However, it is important to acknowledge that technology is not a natural ally of democracy in the sense that it does not necessarily and always enhance democracy. Sometimes, its introduction in political processes undermines democracy rather than strengthening it, depending on the intention for deploying the technology, the level of public access to the technology, the level of transparency and the accountability on the deployment of the technology. There are certain prerequisites that should be put in place to ensure that AI, as a form of technology, will enhance rather than undermine democracy generally and, in particular, in Africa. First is that the development and deployment of AI should be subjected to an international system of standards, including ethical standards, that are based on international human rights law. Efforts must be made to establish an independent international body which leads the development of these standards as well as enforce them to ensure that private technology companies comply with them as they develop and roll out AI. Such an oversight body could be established as part of the United Nations Human Rights Special Mechanisms. For example, it could be in the form of a United Nations Special Rapporteur on the development and deployment of AI. Alternatively, the mandate of the ITU can be expanded to address these issues. At the regional level, a mechanism for the control of AI's impact on human rights could also be established under the auspices of the African Charter in the form of a Special Rapporteur or a Working Group.

Furthermore, whether technology (including AI) will have a negative or positive impact on democracy depends on the political will and the intention behind procuring such technology. Where such technology is procured and deployed for use by autocratic

95 Freedom in the World: Report Egypt.
96 See Freedom in the World 2021: Report Tanzania.
97 Ibid.

regimes, it is often used to undermine and suppress democracy, as has been illustrated in the examples discussed above. Therefore, for AI to positively impact democracy, it is necessary for Africans to address existing democracy deficits and create political conditions in which AI and any other technologies can be used properly to support the advancement of democracy. Put differently, although AI has the potential to advance democracy, it may not create democracy in autocratic contexts. Rather, the people of Africa must fix the democracy deficit first before there can be an expectation for AI to promote and sustain democracy. In democratic African states, governments must enhance their technical capacity to manage and maintain AI-powered systems once they have been installed. Currently, as demonstrated above, most governments subcontract the management and control over these systems to external technology companies, and this leaves room for the technology to be manipulated and to be used for purposes which do not advance local democracy, but rather advance foreign interests.

5.6 References

‘98 personal data points that Facebook uses to target ads to you’ *Washington Post* (19 August 2016) <https://www.washingtonpost.com/news/the-intersect/wp/2016/08/19/98-personal-data-points-that-facebook-uses-to-target-ads-to-you/>.

ABC News ‘Facebook’s oversight board: Watchdog or distraction’? <https://abcnews.go.com/Technology/wireStory/facebooks-oversight-board-watchdog-distraction-77526087>.

ADF: ‘Zimbabwe turns to Chinese technology to expand surveillance of citizens’ <https://adf-magazine.com/2023/01/zimbabwe-turns-to-chinese-technology-to-expand-surveillance-of-citizens/>.

Andersen R ‘The Panopticon is already here’ *The Atlantic* <https://www.theatlantic.com/magazine /archive/2020/09/china-ai-surveillance/614197/>.

Brussee V ‘China’s Social Credit Score – Untangling Myth from Reality’ (2022) <https://merics.org/en/comment/chinas-social-credit-score-untangling-myth-reality>.

‘Cambridge analytica and its role in Kenya’ *CNBC* (23 March 2018) <https://www.cnbc.com/2018/03/23/cambridge-analytica-and-its-role-in-kenya-2017-elections.html>.

‘Cambridge analytica Facebook influence US election’ *The Guardian* (17 March 2018) <https://www.theguardian.com/news/2018/mar/17/cambridge-analytica-facebook-influence-us-election>.

‘Cambridge analyticas ruthless bid to sway the vote in Nigeria’ *UK News* (21 March 2021) <https://www.theguardian.com/uk-news/2018/mar/21/cambridge-analyticas-ruthless-bid-to-sway-the-vote-in-nigeria>.

‘China is exporting facial recognition to Africa ensuring AI dominance through diversity’ <https://qz.com/africa/1287675/china-is-exporting-facial-recognition-to-africa-ensuring-ai-dominance-through-diversity/>.

‘China3

_experts report China hacking African Union HQ fits larger pattern’ <https://www.voanews .com/a/east-asia-pacific_voa-news-china_experts-report-china-hacking-african-union-hq-fits-larger-pattern/6200356.html>.

‘China’s social credit score untangling myth reality’ <https://merics.org/en/opinion/chinas-social-credit-score-untangling-myth-reality>.

Chiumbu S ‘Chinese Digital Infrastructure, Smart Cities and Surveillance in Zambia’ (2021) <https://www.mediaanddemocracy.com/uploads/1/6/5/7/16577624/zambia_report.pdf>.

CIVICUS: ‘Civic Space Monitor’ <https://monitor.civicus.org/country/taiwan/>.

CIVICUS: ‘Tag Taiwan’ <https://www.civicus.org/index.php/fr/component/tags/tag/taiwan>.

Cofone IN ‘AI and Judicial Decision-Making’ in Martin-Bariteau F & Scassa T (eds) *Artificial Intelligence and the Law in Canada*.

Cooley A *Treatise on the Law of Torts* 2nd edn (Chicago: Callaghan & Co, 1888).

David M ‘AI and the Illusion of Human-Algorithm Complementarity’ *Social Research: An International Quarterly* Vol. 86 No. 4 (Winter 2019) 887–908.

Deibel T Back to (for) the Future: AI and The Dualism of Persona and Res in Roman’ (2021) *European Journal of Law and Technology* Vol. 12 No. 2.

Deputy Minister Andries Nel: ‘Launch of GovChat’ (25 September 2018) <https://www.gov.za/ speeches/govchat-25-sep-2018-0000>.

Enonchong L-S, Fokala E and Abebe AK (eds) *Democracy in Africa: Regression and Resilience* (Juta, 2022).

Eubanks V *Automating Inequality: How High-Tech Tools Profile, Police and Punish the Poor*’ (St Martin’s Press, 2015).

Feldstein S ‘The Global Expansion of AI Surveillance’ *Carnegie Endowment International* (2019).

Freedom in the World 2021: ‘Democracy under Siege’ Freedom House (2021).

Freedom in the World 2021: Report Egypt <https://freedomhouse.org/country/egypt/freedom-net/2021>.

Freedom in the World 2021: Report Tanzania <https://freedomhouse.org/country/tanzania /freedom-world/2021>.

‘Government data must stay in South Africa says state technology executive’ (28 March 2022) <https://mg.co.za/news/2022-03-28-government-data-must-stay-in-south-africa-says-state-technology-executive/>.

Gutwirth S, Poullet Y, De Hert P, de Terwangne C, Nouwt S (eds) *Reinventing Data Protection?* (Dordrecht: Springer, 2009).

Hankey S, Morrison JK and Naik R ‘Data and Democracy in the Digital Age’ (2018) <https://consoc.org.uk/wp-content/uploads/2018/07/Stephanie-Hankey-Julianne-Kerr-Morrison-Ravi-Naik-Data-and-Democracy-in-the-Digital-Age.pdf>.

Harari YN *Homo Deus: A Brief History of Tomorrow* (Random House, 2016).

Helbing D et al. ‘Will democracy survive bid data and artificial intelligence?’ *Scientific American* 25 February 2017.

Hervé A ‘Data Protection and Artificial Intelligence: The European Union’s Internal Approach and Its Promotion through Trade Agreements’ in Peng S, Lin C & Streinz T (eds) *Artificial Intelligence and International Economic Law: Disruption, Regulation, and Reconfiguration*.

‘How Cambridge analytica poisoned Kenya’s democracy’ *Washington Post* (20 March 2018) <https://www.washingtonpost.com/news/global-opinions/wp/2018/03/20/how-cambridge-analytica-poisoned-kenyas-democracy/>.

Hu M ‘Cambridge Analytica’s black box’ Big Data & Society (2020).

‘Huawei technicians helped African governments spy on political opponents’ <https://www.wsj .com/articles/huawei-technicians-helped-african-governments-spy-on-political-opponents-11565793017>.

Human Sciences Research Council: ‘AI technologies for responsive local government in South Africa’ (2019) <http://www.hsrc.ac.za/en/research-outputs/view/10337>.

Issenberg S ‘How President Obama’s campaign used big data to rally individual voters’ (2013) *Technology Review –Manchester Nh-. 116* 38–49.

Jili B ‘Surveillance Technology a Concern for many in Africa’ *New Africa Daily* (29 December 2020) <https://newafricadaily.com/surveillance-technology-concern-many-africa#:~:text=Hua wei’s%20first%20African%20Safe%20City,officers%20and%20195%20police%20stations>.

Jing M and Dai S ‘China recruits Baidu, Alibaba and Tencent to AI “national team” *South China Morning Post* (21 November 2017) <https://www.scmp.com/tech/china-tech/article /2120913/ china-recruits-baidu-alibaba-and-tencent-ai-national-team>.

Kamarck E ‘Malevolent soft power, AI, and the threat to democracy’ (November 2018) <https://www.brookings.edu/research/malevolent-soft-power-ai-and-the-threat-to-democracy/>.

Karanasiou A and Pinotsis D ‘Towards a legal definition of machine intelligence: the argument for artificial personhood in the age of deep learning’ in *Proceedings of the 16th edition of the International Conference on Artificial Intelligence and Law (ICAIL ‘17)* (Association for Computing Machinery, New York, USA) 119–128.

‘Lawyer drags zec zanu pf econet to court’ *The NewsDay* (2018) <https://www.newsday .co.zw/2018/07/lawyer-drags-zec-zanu-pf-econet-to-court/>.

Liu J ‘China’s data localization’ *Chinese Journal of Communication* (2020) 13:1 84–103.

‘Mark Zuckerberg Facebook whistleblower’ *Washington Post* (25 October 2021) <https://www. washingtonpost.com/technology/2021/10/25/mark-zuckerberg-facebook-whistleblower/>.

Martin-Bariteau F & Scassa T (eds) *Artificial Intelligence and the Law in Canada* (Toronto: LexisNexis Canada, 2021).

Maxwell E ‘China ranks “good” and “bad” citizens with “social credit” system’ <https://www.france24.com/en/20190501-focus-china-social-credit-system-mass-surveillance-citizens-ranking-behaviour-criticism>.

Ministerial Statement on Progress of the Smart Zambia Initiative’ <https://www .parliament.gov.zm/sites/default/files/images/publication_docs/Ministerial%20statemen t%20on%20PROGRESS%20ON%20THE%20SMART%20ZAMBIA%20VISION.pdf>.

Mudongo O: ‘Africa’s Expansion of AI Surveillance — Regional Gaps and Key Trends’ Research ICT Africa Policy Brief 3/2021 <https://researchictafrica.net/wp/wp-content/uploads /2021/01/AI-Surveillance_Policy-Brief_Oarabile_Final.pdf>.

‘Obama, Facebook and the power of friendship: the 2012 data election’ *The Guardian* (17 February 2012) <https://www.theguardian.com/world/2012/feb/17/obama-digital-data-machine-facebook-election>.

OECD: 'Policy initiatives' <https://oecd.ai/en/dashboards/policy-initiatives/http: %2F%2 Faipo.oecd.org%2F2021-data-policyInitiatives-24274>.

Owen D & Davis R 'Presidential Communication in the Internet Era' (2008) *Presidential Studies Quarterly* 38(4) 658–673.

Pendlebury M 'Individual Autonomy and Global Democracy' *Theoria: A Journal of Social and Political Theory* (2004) 103 43–58.

Peng S, Lin C & Streinz T (eds) *Artificial Intelligence and International Economic Law: Disruption, Regulation, and Reconfiguration* (Cambridge: Cambridge University Press, 2021).

Peters K 'Technology to Invite, Inform, and Modernize: How Platforms Support Democratic Participation' (2020) 4 *Geo. L. Tech. Review* 429.

Pew Research Center: 'The Future of Digital Spaces and Their Role in Democracy' 22 November 2021.

Pew Research Centre: 'Many tech experts say digital disruption will hurt democracy' (21 February 2020} <https://www.pewresearch.org/internet/2020/02/21/many-tech-experts-say-digital-disruption-will-hurt-democracy/>.

Risse M 'Artificial Intelligence and the Past, Present, and Future of Democracy' *Carr Center Discussion Paper Series* (2021).

'Roll-out of Huduma card is unlawful judge rules' <https://www.standardmedia.co.ke /national/article/2001426231/roll-out-of-huduma-card-is-unlawful-judge-rules>.

Rouvroy A and Poullet Y 'The Right to Informational Self-Determination and the Value of Self-Development: Reassessing the Importance of Privacy for Democracy' in Gutwirth S, Poullet Y, De Hert P, De Terwangne C, Nouwt S (eds) *Reinventing Data Protection*.

Samoili S et al. 'Defining Artificial Intelligence. Towards an operational definition and taxonomy of artificial intelligence' (2020) <https://publications.jrc.ec.europa. eu/repository/bitstream/JRC118163/jrc118163_ai_watch._defining_artificial_ intelligence_1.pdf>.

Schedler A 'The Menu of Manipulation' *Journal of Democracy* (2002) Vol. 13 No. 2 37–50.

Schippers B 'Artificial Intelligence and Democratic Politics' *Political Insight* (March 2020).

'Suspected Chinese hackers stole camera footage from African Union memo ID' <https://www. reuters.com/article/us-ethiopia-african-union-cyber-exclusiv/exclusive-suspected-chinese-hackers-stole-camera-footage-from-african-union-memo-idINKBN28Q1DB?edition-redirect=in>.

Susser D, Roessler B and Nissenbaum H 'Online Manipulation: Hidden Influences in a Digital World' (2019) 4 *Geo. L. Tech. Review* 1.

'Taiwan is making democracy work again. It's time we paid attention' *Wired* <https://www. wired.co.uk/article/taiwan-democracy-social-media>.

Tucci L et al. 'A guide to artificial intelligence in the enterprise' *Techtarget* (2021) <https:// www.techtarget.com/searchenterpriseai/Ultimate-guide-to-artificial-intelligence-in-the-enterprise>.

Turse N 'How the NSA Built a Secret Surveillance Network for Ethiopia' (2017) <https://theintercept.com/2017/09/13/nsa-ethiopia-surveillance-human-rights/>.

'Uganda elections 2021: Facebook shuts government-linked accounts' <https://www.bbc.com/news/world-africa-55623722>.

'Uganda uses China's Huawei facial recognition to snare protesters' <https://qz.com/africa /1938976/uganda-uses-chinas-huawei-facial-recognition-to-snare-protesters/>.

'Unstructured Supplementary Service Data' is the technology for short texting instructions between a mobile phone device and another application program in the network.

USA Department of Health, Education and Welfare Records: Computers and the Rights of Citizens: Report of the Secretary's Advisory Committee on Automated Personal Data Systems (July 1973) <https://www.justice.gov/opcl/docs/rec-com-rights.pdf>.

Warren SD & Brandeis LD 'The Right to Privacy' *Harvard Law Review* Vol. 4 No. 5. (15 December 1890) 193–220.

'What the World Can Learn From Taiwan's Digital Democracy' *The Wired* (24 January 2022) <https://www.wired.co.uk/article/global-neighbourhoods-digital-democracy>.

'What-is-artificial-intelligence-for-social-media?' <https://www.marketingaiinstitute.com/blog/ what-is-artificial-intelligence-for-social-media#:~:text=An%20AI%2Dpowered%20social%20monitoring,insights%20based %20on%20that%20information>.

'Whatsapp fake news Brazilian election' *The Guardian* (30 October 2019) <https://www. theguardian.com/world/2019/oct/30/whatsapp-fake-news-brazil-election-favoured-jair-bolsonaro-analysis-suggests>.

'Whatsapp skewed Brazilian election showing social media's danger to-democracy' *Newshour* <https://www.pbs.org/newshour/science/whatsapp-skewed-brazilian-election-showing-social-medias-danger-to-democracy>.

'Will Democracy Survive Big Data and Artificial Intelligence?' *Scientific American* <https://www.scientificamerican.com/article/will-democracy-survive-big-data-and-artificial-intelligence/>.

'Zimbabwe turns to Chinese technology to expand surveillance of citizens' <http://www.gov.cn/gongbao/content/2017/content_5160241.htm>.

Chapter 6

Genderless human input and artificial intelligence in digital credit: A closer look at unintended consequences

6.1 Background

This chapter examines the impact of gender bias in artificial intelligence (AI)-based consumer digital credit transactions. In AI systems, bias is introduced when algorithms learn from prejudiced human inputs, societal bias in the media or unrepresentative training datasets. This could result in discrimination based on gender, age, race, religion, political ideology, culture, marital, and wealth status. Although AI as an emerging technology is assumed to possess the capacity to make error-free credit decisions without human bias, studies are revealing that the determination of credit eligibility built on AI, embodies covert bias. This chapter explores the impact of human-generated AI bias on consumer lending using a gender lens, particularly given the importance of access to credit for women. The chapter reveals that even in situations where seemingly gender-neutral data is utilised, gender alternates such as career types and nuances in language usage can identify and categorise female borrowers with adverse impacts. The unintended consequences of this and the difficulty in regulating AI are examined. Furthermore, reference is made to the UNESCO 'Recommendation on the Ethics of Artificial Intelligence' and insights for navigating the gender bias challenge are detailed. It is expected that understanding these dynamics and reflecting them in economic business models and regulatory frameworks, would foster fair lending irrespective of gender.

6.2 Introduction

The lack of access to credit is the bane of 400 million African adults, with women comprising nearly 60 % of this figure.[1] Research shows that even though women own almost half of the small businesses in Africa, obtaining access to credit remains a hurdle compared to men.[2] The difficulty in getting credit stems from barriers such as 'poverty, discrimination, a lack of institutional support and outdated gender norms' resulting in about $42 billion financing gap for women.[3] Women are also debarred by lower education levels and less likelihood to have a job outside the home. This is

1 Bill & Melinda Gates Foundation 'A G7 Partnership for Women's Digital Financial Inclusion in Africa'.
2 Kimani M 'Banking on African women: Loan guarantees and private partners improve access'.
3 Toesland F 'Finance gender gap costs Africa $95bn per year'.

despite evidence that women's access to finance transcends individual use to encompass household benefit as, while more men invest only an average of 30–40 % of their income in their family's needs, women invest as much as 90 % of their income.[4]

In general, the application of AI to systems seems to provide some solutions. It is argued that decisions made by algorithms are superior to those made by humans as data is integrated faster, complex tasks are computed quicker, and there is greater possibility of objectivity.[5] AI application also has the potential to bring value to business by using intelligent automation to replace repetitive manual tasks, increase workers' judgement, improve interactions with customers and develop intelligent products.[6] Furthermore, AI application provides feedback and proactive guidance that encourages prioritising consumer welfare.[7]

Thus, AI application lends itself to the design of personalised products suitable for specific consumer segments that require niche financial services. AI applications equally find relevance in cyber security, fraud detection, risk assessment, credit determination, customer engagement using chatbots and the avoidance of churn (discarding a financial product soon after signing up).[8] Algorithms also foster efficiency, cost reduction, and product personalisation.[9] Furthermore, machine learning (ML), which is a subset of AI, can predict customer behaviour using transaction and purchasing patterns to forecast future spending and income and, in turn, aid the determination of loan eligibility.[10]

In the African credit sector, the use of AI application is already evident. The African Development Bank (ADB) has approved a grant of $1.024 million to the national banks of Ghana and Rwanda and the Competition and Consumer Protection Commission of Zambia for the use of AI to process customer complaints and track complaints resolutions using multi-lingual chatbots.[11] AI is increasingly deployed in the delivery of finance, including to disadvantaged populations. Financial services providers (FSPs) devise unconventional solutions to augment incomplete identity databases and credit registries to help clients without a credit history or collateral to apply for credit facilities.

One example is Kenya's Tala, a savings and loan app that applies AI to identify consumers and substitute formal credit history using alternative data from a borrower's social connections and transaction footprints.[12] Mpesa's Mshwari loan service creates credit scores based on call logs, airtime usage, and credit for clients without credit

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4 Ibid.
5 Pessach D and Elsevier ES 'Improving fairness of artificial intelligence algorithms in Privileged-Group Selection Bias data settings' at 1.
6 Jubraj R Graham T and Ryan E *Redefine Banking with Artificial Intelligence* (2018) at 2.
7 Nickie MH *How Artificial Intelligence Affects Financial Consumers*.
8 Sovtech: 'How is AI Being Used in the African Fintech Industry?'
9 Floridi L, Seng M and Lee A 'Algorithmic Fairness in Mortgage Lending: from Absolute Conditions to Relational Trade-offs Springer Minds and Machines' at 165.
10 Zintle '3 Technologies that are Reshaping the Banking Industry in Africa'.
11 ADB: 'African Development Bank provides $1 million for AI-based national customer management systems in Ghana, Rwanda and Zambia'.
12 Tala: 'Tala <https://tala.co/about/> (accessed 14 March 2022).

records.[13] In South Africa, Akiba provides an AI-powered platform that connects small-business owners with FSPs using an alternative credit scoring infrastructure.[14] Tanzania's Mipango offers personal finance using an AI robo-advisor.[15] In Nigeria, the Specta social lender offered by Sterling Bank uses AI to offer personalised financial products and determine clients' credit scores and risk.[16] Similarly, Branch offers machine-learning-based mobile lending and services using smartphone data, such as call logs and SMS history, for identity authentication and determination of loan eligibility, thereby replacing the need for paperwork or guarantors for persons without credit history.[17]

However, the promises of AI application are not without demerits as the argument that AI has the capacity to make error-free judgements (particularly in the sphere of determining credit eligibility of prospective borrowers) is currently being scrutinied, as well as the fact that AI excludes specific classes of borrowers such as women, and reinforces discriminatory practices through profiling. As observed in recruitment-use cases, women could be further disadvantaged where available data do not reflect their abilities or in situations where wrong data sets or poorly designed algorithms skew processes in favour of men.[18]

In addition, AI systems could embody covert bias, resulting in outright rejection, or varying pricing, interest rates, and terms of repayment. This last concern forms the core of this chapter which adopts a gender lens focused on women to examine the unintended consequences and impact of applying AI to credit determination. In the succeeding sections, the chapter outlines the importance of credit for women as well as the disproportionate exclusion of women from obtaining credit facilities. Thereafter, a discussion on how bias is introduced into data is detailed as is the difficulty in regulating AI. Where necessary, reference is made to the UNESCO 'Recommendation on the Ethics of Artificial Intelligence'. The chapter ends with some insights to help actors in the value chain of AI-based lending to navigate the challenges of gender bias and improve women's access to credit. Definition of key terms used in this chapter is given below.

6.3 Definitions

6.3.1 *Artificial intelligence*

AI is defined as a suite of technologies, enabled by adaptive predictive power and exhibition of some degree of autonomous learning, that advance the ability to recognise patterns, anticipate future events, create rules, make decisions and

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13 Qureshi F, Rea SC and Johnson KN '(Dis) Creating Claims of Financial Inclusion: The Integration of Artificial Intelligence in Consumer Credit Markets in the United States and Kenya' at 405–427.

14 Akiba: 'About Akiba'.

15 Mipango: 'Overview'.

16 Sterling Bank: 'Welcome to Specta'. See also Enhancing Financial Innovation and Success: Fintech Report: 'Overview and lessons learnt from global fintech landscape and Nigerian fintech landscape' at 18.

17 Branch: 'Frequently Asked Questions'. See also Deloitte: 'Fintech in Nigeria and the Women who Lead' at 9.

18 Wendehorst C et al. 'Data Governance Working Group A Framework Paper for GPAI's work on Data Governance November 2020'.

communicate.[19] AI can also refer to the technology that enables a machine to simulate the behaviour of humans to solve complex problems, while ML, a subset of AI, enables a machine to automatically learn from past data without the need for specific programming.[20]

6.3.2 *Bias and gender-based algorithmic bias*

In this chapter, the reference to gender speaks primarily to women. Bias refers to any form of preference.[21] Gender-based algorithmic bias occurs when an algorithm creates results that are systemically prejudiced against people on the basis of gender.[22] There are three main types of AI bias namely, (1) data bias which emanates from the use of big heterogeneous data to process outcome; (2) bias garnered from automated decision-making systems (without human interaction); and (3) algorithm bias which is added by algorithms or learned from societal prejudices.[23] AI bias could also be classified using the time of entry into the dataset. These are sampling bias, introduced by over- or underrepresenting a population segment in a training dataset, labelling bias emanating from wrong classification of properties and characteristics of a data point and outcome proxy bias resulting from ill-defined algorithm assignments.[24]

6.3.3 *Consumer credit*

Consumer credit is defined as personal debt taken to purchase everyday goods and services, including credit cards which allow consumers to get an advance on income to buy products and services and includes other collateralised consumer loans like mortgage and car loans.[25] Loans obtained to start a small business or cater for a family emergency also fall within this category. When accessed on a digital platform, this is called digital consumer credit.

6.4 Women's access to financial services

Access and usage of financial services by women culminates in greater developmental impact, inclusivity, and productivity.[26] But without an adapted banking system that offers niche financial products to support women, they continue to grapple with issues of distance to banks and limited opening hours exacerbated by time and mobility

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19 Deloitte: 'The New Physics of Financial Services: How Artificial Intelligence is Transforming the Financial Ecosystem' at 5.
20 Singh C and Lin W 'Can artificial intelligence RegTech and CharityTech provide effective solutions for anti-money laundering and counter-terror financing initiatives in charitable fundraising' at 474.
21 Kelly S and Mirpourian M 'Algorithmic Bias, Financial Inclusion, and Gender A primer on opening up new credit to women in emerging economies Women's World Banking'.
22 Ibid.
23 Cheng L, Varshney K and Liu H 'Socially Responsible AI Algorithms: Issues, Purposes, and Challenges' at 1145.
24 Kelly and Mirpourian at 12.
25 Kagan J 'What is Digital Consumer Credit'.
26 Braun G 'Policy Brief: Advancing African Women's Financial Inclusion'.

constraints.[27] This could also reduce women's agricultural productivity and overall earning capacity in both rural and urban spaces.[28]

In the absence of access to safe formal financial services, women are at risk of utilising some unsafe informal FSPs such as loan sharks. Loan sharks not only offer credit on unfair and stringent terms such as high interest rates that sink borrowers deeper into a cycle of indebtedness, but equally utilise demeaning enforcement practices that could rob women of their dignity. Ultimately, the lack of access to credit could have a negative effect on other facets of women's lives. For example, it is shown that without access to credit, women rely on limited personal assets and informal sources of capital with little prospects for business expansion.[29]

The lower figures for women's access to finance are mainly because of demand-and-supply barriers. On the demand side, particularly in the case of female entrepreneurs, women are noted to rely on self-financing that stems from negative self-selection from loan applications by supposing that they will not be successful.[30] Women tend to rely on self-financing stemming from the assumption, albeit incorrect, that their loans will not be successful. Self-selection by women emanates from perceived low creditworthiness or lower levels of risk tolerance by banks.[31] This results in double jeopardy: women not only miss out on the opportunity of being considered for loans and in turn building a credit history, but also lose the chance to build data feeds that buttress women's reliability in repaying loans. For new bankers, the lack of experience in formal banking may create a barrier that leads women to shy away from taking up financial opportunities in a bid to avoid risks.[32] Engagement in household activities that do not generate income also exclude women from building a credible business management portfolio like men.[33] This could prove detrimental in loan applications.

Supply-side barriers that affect African women are the lack of access to finance due to stringent loan conditions such as higher interest rates or collateral requirements, credit rationing skewed in favour of men and discriminatory gender norms.[34] For instance, debarred by some customs, some African women face the challenge of meeting conventional collateral requirements sought by FSPs.[35] Practices such as insisting on evidence of land titles or ownership of other immovable assets such as houses, demanded as a condition for obtaining a loan grant, disregard the disadvantageous position of women from societies that do not encourage women's ownership or inheritance of property. Lower levels of education and income, lack of employment opportunities, health conditions, lack of access to land, household responsibilities, time and mobility constraints and lack of decision-making powers are additional barriers.[36]

27 Ibid. at 6.
28 Ibid.
29 Ibid. at 4.
30 OECD: 'Do women have equal access to finance for their business?'
31 Morsy H, El-Shal A and Woldemichael A 'Women Self-Selection out of the Credit Market in Africa' at 21.
32 Braun at 6.
33 Ibid.
34 Morsy, El-Shal and Woldemichael at 21.
35 Braun at 6.
36 Ibid.

Other barriers are operation in small-scale business and poor credit rating by FSPs.[37] An example is when owners of small business do not seek loans for business expansion. In terms of exclusion by reason of technology, women in low- and middle-income countries are shown to be 7% less likely to own a mobile phone, and 15% less likely to own a smartphone compared to men.[38] Although the figures for phone ownership by women are growing, Internet access is still catching up. About 60% of women in Africa own mobile phones while only 18% have Internet access.[39]

Significantly, the fact that women have been historically marginalised from accessing credit due to inaccurate or incomplete data that are not adapted to the challenges that women face can cause further barriers.[40] With the emergence of AI, the existing systemic marginalisation of the credit systems in favour of men can be transferred and continued on within the digital sphere. FSPs and credit bureaux have insufficient disaggregated data on women with regard to creditworthiness.[41] Women are also largely invisible or underrepresented in numerous data points such as mobile phone and Internet usage, housing, employment and the lack of ownership of account-opening documentation exacerbated by strict know-your-customer (KYC) rules.[42] Therefore, when these disproportionately skewed data are fed into or learned by AI systems, women could be unfairly deemed by algorithms not to be creditworthy because existing data would reveal fewer (successful) loan applications.

It is notable that the reluctance to lend to women is not informed by evidence as research shows that women are more likely than men to repay a debt and women have a lower default rate on loans than men in different credit scenarios including consumer credit, student loans, mortgages, and microfinance loans.[43] Women are observed to repay on time to avoid penalty and other miscellaneous charges.[44] Women also tend more to seek out debt counselling to ensure that debts are repaid, being more likely to be ashamed of debt compared to men that may not seek out help for reason of their ego and rather default with impunity.[45] Specifically, African women borrowers have a strong track record of repayment and saving in informal rotation savings clubs from where they also borrow to manage family financial needs.[46] As family finance mangers, women are known to demonstrate grit in catering for the savings and investment needs of their households even where income is small and irregular.[47]

Given the increasing complexity of credit markets, policymakers and FSPs must strive to ensure that the adoption of AI in credit determination does not become a tool for entrenching already existing inequities in the credit sector. Kraft-Buchman cautions

37 See OECD: 'Do women have equal access to finance for their business?'
38 Carboni I et al. 'Connected Women: The Mobile Gender Gap Report 2021' at 7.
39 Rizk N 'AI and Gender in Africa' <https://openair.africa/ai-and-gender-in-africa/?> (accessed 12 November 2022).
40 Ibid.
41 Braun at 6.
42 Ahmed S 'A Gender perspective on the use of Artificial Intelligence in the African FinTech Ecosystem: Case studies from South Africa, Kenya, Nigeria, and Ghana'.
43 Durkheimer M 'Millennial Men More Likely than Women to Default on Student Debt'.
44 Sigler W 'Women handle loans better than men: Key trends across auto, personal loan segments'.
45 Ibid.
46 Braun at 4.
47 Ibid. at 1.

that ML mirrors implicit information, including 'missing data' on women and girls, hardwires these into new and stereotypical associations of gender, which could in turn evolve into a more pervasive patriarchy that is more difficult to unwire.[48] The UNESCO 'Recommendation on the Ethics of Artificial Intelligence' also stresses the importance of maximisation of the potential of digital technology and AI to contribute to achieving gender equality and ensure that gender stereotypes and biases are not translated into AI systems.[49]

The following section details the application of AI in ascertaining eligibility for credit facilities and how seemingly neutral training datasets can none-the-less, usher in bias. The impact of this bias on women is outlined next.

6.5 How does artificial intelligence learn bias?

The inability to access credit can strain social credit channels such as family members or rotating clubs and open the opportunity for predatory micro-lending and betting and increase women's patronage of risky informal FSPs.[50] But the introduction of AI to digital credit could be game-changing. Applying AI to credit determination has the potential to provide beneficial formal finance to the financially excluded, particularly for women. AI applications could facilitate fraud detection and prevention with the help of data from clients' financial history and activities.[51] Also, ML is leading voice recognition and predictive analysis in financial services and enabling robots and chatbots to provide financial advice, analyse risks, and manage assets and trade.[52]

In the use of personal credit data, AI innovations help to predict future client behaviour and risk and to develop credit scores, determine the price of credit assigned to each class of consumers and predict future earnings.[53] As shown above, FSPs use alternative data such as financial transactions, social media activities and social connection scores to provide loans to clients that have no credit history, predict client default rates, improve pricing and to reduce loan operation and origination costs.[54] Caution should however be taken when using AI for profiling and predicting customer behaviour to avoid putting women at the risk of cyber-attacks, cyber terrorism and ransom ware. Despite the application of AI to determine client eligibility for digital credit, some concerns exist as bias can sneak into data through a couple of ways. These ways are detailed below.

6.5.1 *Bias from human-led processes*

AI-powered systems can deepen the bias inherent in human-led processes. This is particularly the case when the models and data used during training re-establish the inefficiencies of their creators.[55] Bias can be inadvertently or deliberately introduced at

48 Kraft-Buchman C 'We Shape Our Tools, and Thereafter Our Tools Shape Us'.
49 UNESCO 'Recommendation on the Ethics of Artificial Intelligence' at 32.
50 Qureshi, Rea and Johnson at 413.
51 Lui A and Lamb GW 'Artificial intelligence and augmented intelligence collaboration: regaining trust and confidence in the financial sector' at 276.
52 Lin TC 'The New Financial Industry' at 567.
53 Benthall S and Vilijoen S 'Data Market Discipline: From Financial Regulation to Data Governance' at 459 and 462–464.
54 Johnson K and Reyes C 'Exploring the Implications of Artificial Intelligence' at 326.
55 Carman M and Rosman B 'Applying a principle of explicability to AI research in Africa: should we do it?' at 113.

any stage. Deliberate introduction which is difficult to detect could include improper labelling of datasets by developers and use of incomplete data that excludes a class of persons.[56] Research confirms that notwithstanding the specificity of design, algorithms still manifest the social contexts and biases inherited during training, and incomplete or skewed datasets can affect the accuracy of predictions.[57] This can equally heighten existing bias and wield inequity and discrimination, particularly as ethical legislative regulation in the field is only recent and not yet robust.[58] Apart from entrenching pervasive gender stereotypes, AI application can also take a toll on long-term psychological, economic, and health security of women.[59]

Again, since AI systems learn from historic data, there is always a chance that dated but once pervasive practices used to assess creditworthiness can continue to wield bias. An example is the use of words such as 'wife', 'Miss' or 'Mrs' to describe women's marital status in considering loan grants.[60] Similarly, outdated references for women such as the interchange of the term 'girl' for 'woman' has been found to depict women as immature, innocent, youthful, of subordinate status, emotionally weak or financially dependent with attendant negative overtones.[61]

Research on image collections, supported by Microsoft and Facebook, have been shown to allude activities such as shopping and washing and images of kitchen objects such as spoons and forks to women while connecting coaching and shooting as well as outdoor sporting equipment such as snowboards and tennis rackets to men.[62] Similarly, a Google experiment on news articles showed a connection of women to occupations such as homemaker, librarian and nanny, and an association of maestro, philosopher and financier to men.[63] Accordingly search results for 'nan is to computer programmer, as woman is to X,' returned 'homemaker'.[64]

Although some of these practices are being addressed, the fact that past indicators of creditworthiness could still be available in legacy data on bank repositories, Internet searches or cloud services could be detrimental to women. This is because these pieces of information can be learned by algorithms even if not originally included in the AI training data.[65] In other words, these algorithms could still persist in the notion of unmarried or young women previously being less likely to be accepted for credit as a gauge for inability or repay loans and, therefore, a trend to be followed.[66] When learned by algorithms from legacy data, these allusions could add to the considerations that unfairly judge women as unable to repay loans.

56 Sefala R 'A view from another set of eyes'.
57 Qureshi, Rea and Johnson at 415.
58 Cataleta MS & Cataleta A 'Artificial Intelligence and Human Rights, an Unequal Struggle' at 41.
59 Smith G and Rustagi I 'When Good Algorithms Go Sexist: Why and How to Advance AI Gender Equity'.
60 Leavy S 'Gender Bias in Artificial Intelligence: The Need for Diversity and Gender Theory in Machine Learning' at 15.
61 Ibid.
62 See Kraft-Buchman.
63 Ibid.
64 Ibid.
65 Monk H 'International Women's Day: Addressing gender bias in AI'.
66 Smith and Rustagi.

6.5.2 *Bias from alternative data*

The use by AI systems of alternative data such as social media data to determine creditworthiness also ushers in concerns. Alternative data and algorithms are understood to aid lending to previously excluded customers but can raise important issues, such as data-consent management, data accuracy, inappropriate uses or inferences and use that is inconsistent with the purpose of collection without good data governance.[67] In a digital-credit scenario, insights from user profiles and connections can be misread to equate creditworthiness in assuming that financially responsible people socialise with one another while denying persons without these social connections of credit even though they might be creditworthy.[68] Some AI systems utilise behavioural patterns such as capitalisation of first letter, gambling habits, time spent at work, phone type and information on phone to ascertain creditworthiness for clients without a credit history.[69] Others utilise educational levels of clients by noting errors in spellings on internet searches.[70]

Clearly, these are not conclusive proof of creditworthiness. The level of education of a person, for instance, does not automatically evince creditworthiness as some persons without formal education could be financially better off than persons garlanded with numerous academic degrees. Unfortunately, utilising these criteria as a benchmark for determining success in loan applications can cause bias against people with lower levels of formal learning, which are more represented by women.

6.5.3 *Bias stemming from the limited availability of data on women*

Another notable concern in the use of AI to ascertain creditworthiness is the disproportionately limited availability of data on women. The fact that the creators of AI systems are mainly male, makes the concern more dismal. Even the prevalence of feminised machines, such as Alexa, Google Home and Siri, that have female voices as default, are trained on the recordings of male voices and are therefore more likely to understand male commands.[71] Research shows that the overrepresentation of males in AI development teams and professions could mirror the biases of their creators during generation, collection and formulation of rules and variables.[72]

Evidently, women represent only 22% of professionals in AI and data science and mainly occupy subordinate positions.[73] Only 20% occupy technical roles at major ML programs and 6% are professional AI software developers.[74] The figures are equally low in women's representation in computing and AI-related careers, college admissions for computer science, computer and software engineering, participation in start-ups, product development and policy development teams.[75] The lack of diversity in AI teams could mean that data from which AI systems learn to mimic gender gaps in our world,

67 Wendehorst.
68 Qureshi, Rea and Johnson at 418.
69 Kelly and Mirpourian at 5.
70 Lui and Lamb at 279.
71 Wendehorst.
72 Smith and Rustagi.
73 Ibid.
74 Madgavkar A 'A conversation on artificial intelligence and gender bias'.
75 Kidden S 'Gender and Artificial Intelligence Readiness in Africa: Can new technological innovations address an unequal playing field' at 1.

and could weigh against women as a result of fewer data input.[76] Unfortunately, fixing these problems is not so easy as this will depend on whims of developers and what they subjectively deem to be important; emphasizing why the diversity of AI teams to contribute wide perspectives is critical from the initial stages.[77]

6.5.4 *Bias from gender-blind data*

Averting the possibility of gender bias in AI-based lending systems is not always clear-cut, even where conscious effort is made to only include gender-neutral datasets. Experts argue that it is rare to find unbiased or gender-blind data.[78] In a number of studies it has been buttressed that notwithstanding the efforts by some companies to collect data that is neutral, bias could still sneak into an AI system.[79] This could be during collection, cleaning, processing, and integration.[80] As stated earlier, AI learns patterns in data on the internet that associate men with power, success, and fame and women with sexuality, looks and family, in reflection of societal bias.[81]

Therefore, seemingly neutral data, while not trained to identify the male and female gender, could bear proxies that have the potential to reveal gender indicators.[82] A good example is the gendered differentiation of names which enables algorithms to identify male and female gender.[83] Names such as Emeka or Dembe will over time likely be classified as male, while Thandiwe or Nubia will bear female connotations as the algorithms learn over time to interact with these names within male and female contexts.

6.5.5 *Bias from language and historic societal gender qualifiers*

Usual terms for describing men and women are yet another means for algorithms to identify gender. Terms such as ‘family man’, ‘single or working mother’, and ‘career woman’ are gender identifying terms.[84] This is also observed in relation to occupation descriptions such as ‘female lawyer’ or ‘female judge’ which connote a contradiction from societal expectations.[85] Occupations that have historically been dominated by men or women also contribute to these classifications with telling implications for women. Some AI systems have associated professions such as ‘soldiers’ and ‘nurses’ as male and female respectively.[86] Others have also been observed to label terms such as ‘nanny’ and ‘housekeeper’ as women and unfortunately associate more high-status occupations such as ‘executive’ and ‘doctor’ as men.[87]

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76 Smith and Rustagi.
77 Sefala.
78 Kelly and Mirpourian at 13 and 17.
79 Richardson R, Schultz J and Crawford K ‘Dirty Data, Bad Predictions: How Civil Rights Violations Impact Police Data, Predictive Policing Systems, and Justice’ at 192.
80 Ibid.
81 Mandal A ‘The Algorithmic Origins of Bias Why is AI biased? Is it designed to be biased or is it an unintentional flaw in the system?’.
82 Chapman JE ‘Fintech: Is the Water Fine?’ at 449.
83 Wellner G and Rothman T ‘Feminist AI: Can We Expect Our AI Systems to Become Feminist?’ at 193.
84 Leavy at 15.
85 Ibid.
86 Wellner and Rothman at 192.
87 Zhang D et al. ‘The AI Index 2022 Annual Report’ at 136.

Gender could also be identified by algorithms during language translation, particularly when gendered references are usual in one of the languages. Languages such as Hebrew are noted to innately bear a reference to gender by alluding to names of artefacts and adjectives and could assign gender when translating from more neutral languages such as English.[88] Similarly, in translating to the Turkish language from English, AI application has been shown to designate professionals such as 'soldiers', 'translators' and 'doctors' as male and others such as 'teachers' and 'nurses' as female.[89] Again, although the Turkish language has no 'he' or 'she' pronouns, Google Translate was found to invent gender pairings resulting in terms such as 'she is a cook', 'he is an engineer', 'he is a doctor', 'she is a nurse', 'he is hard working', 'she is lazy'.[90]

As explained above, even without originally having male and female designates in the training data, algorithms learn to reference a particular profession as male or female over time. Men are more likely to be categorised as professionals while women could get pigeon-holed to family-oriented roles.[91] Implicitly, algorithms can pick up these classifications to designate the male and female gender to different professions, albeit erroneously. According to experts, although the training data used in such situations are not inherently intended to be prejudiced, bias results due to our language.[92] The use of pre-trained multilingual models to increase translation performance as a solution for this concern has been suggested even though the likely underperformance of both low and high resource languages due to gender accuracy gaps is acknowledged.[93]

To ensure that the benefits of AI application accrue fairly and proportionately to women, regulators need to step into the scene whether as policymakers making rules for AI developers and users or as umpires monitoring compliance with industry-devised rules. The dynamics of guaranteeing fair rules for AI systems form the core of the ensuing discussion.

6.6 Difficulty in obviating gender bias through regulation

Responsible AI deployment can help to stave off gender bias and improve the chances of women in loan applications. Hence, the role of the regulator is crucial to ensuring the responsible design of AI by developers and FSPs at all stages of deployment to benefit everyone, regardless of gender. As the field unfurls, the responsible regulator could be that of the financial sector, data protection, ICT or competition, independently or in collaboration with others. Without regulation, AI system developers can become in a sense, rule makers that exercise discretion to promote self-serving ideals that may be at odds with public values without regard for the implications of bias.[94] Regulation is therefore important in all cases whether in deliberate discrimination where developers manipulate the system for a specific outcome or in inadvertent circumstances such as when AI systems, through interacting with big data or other algorithms, learn to be biased.

88 Wellner and Rothman at 192.
89 Ibid.
90 See Kraft-Buchman.
91 Wellner and Rothman at 192.
92 Ibid. at 193.
93 Zhang D et al. at 138.
94 Busuioc M 'Accountable Artificial Intelligence: Holding Algorithms' at 831.

Undoubtedly, regulating AI-based decision-making systems presents some hurdles. In the first place, AI learns from our biased society and without caution could replicate and hardwire bias into our technology systems. Artificial neural networks (ANNs), for instance, which are used in AI applications such as voice assistants and self-driving cars, are understood to be patterned after the human brain which like a baby, has to learn using large data repositories, complicating the possibility of effective data bias vetting.[95] In the case of ML models, generalisations and correlations used for AI system training can amplify and reinforce the bias in training data with unfair accuracy.[96] The solution of data labelling through the use of crowd-sourced manual labelling from undiversified participants is not fool proof and are equally susceptible to bias.[97] For example, the OpenImages dataset was found to associate women with images of cosmetics, dolls and washing machines and men with rugby and beer and also to return poses in a studio for women and formal ceremonies with bouquets for men for the search term of 'flower'.[98]

Secondly, the complex and obscure nature of AI still leaves many concerns about practical measures in detecting where bias begins.[99] The limited visibility on how the AI systems function continues to pose a challenge in obtaining proof of bias in AI systems as identifying the point at which bias was admitted into AI datasets is not at all easy. This is because automation increasingly shrouds bias under the cover of machine neutrality and mathematical objectivity.[100] Notably, AI systems are presumed to be creations of mathematics, logic and machinery that result in impartial outcomes but then there is always the human angle, which in creating, introduces, bias inherent in human behaviour like a photographer determining what subjects should be captured in a picture composition.[101]

In situations where AI is applied to make decisions on creditworthiness, without obtaining an AI system report that discloses the reasons for loan decline, it is almost impossible to regulate by assuming knowledge of the reason for a rejection. In the absence of proof of the existence of bias, the chances of getting results for women become bleak. Training data are often not available to the regulators or law enforcement agents and when available, are complex and difficult to interpret, leaving them with the investigation of outcomes alone.[102] Moreover, proprietary ownership of AI systems claimed by developers means that under the protection of privacy and trade-secret safeguards, the obligation to disclose underlying algorithm performance could be evaded.[103]

The difficulty does not only stop with regulators but also extends to developers and FSPs. The increasing sophistication of ML implies that creators might be unable to comprehend the evolution of outcomes and the points of entry of bias.[104] Likewise, the

95 See Mandal.
96 Ibid.
97 Ibid.
98 Ibid.
99 Busuioc at 830.
100 Ibid. at 827.
101 Celis E 'Debiasing the Algorithm.'
102 Cheng, Varshney and Liu at 1159.
103 Busuioc at 829.
104 Lui and Lamb at 279.

opacity of AI systems makes it difficult for system engineers to logically describe, perceive or interpret the functioning of these systems due to the difficulty in ascertaining which parts of the initial input data and their interactions were applied to make a prediction.[105] For instance, the developers of the Amazon recruitment tool expressed surprise that bias crept into a system that embodied only gender-neutral parameters during training.[106] The company had to scrap the tool when it was realised over time, that the system was not rating candidates for software-developer jobs and other technical posts in a gender-neutral way.[107] Similarly, in Kenya, employees of the Mpesa's Mshwari loan service noted that they were unable to understand the context of credit scoring but merely used the calculations arrived at by the algorithms to offer contract conditions.[108]

Significantly, the regulatory hurdle is steeper when confronting discrimination arising as a result of incomplete, incorrect, or non-representative data as opposed to cases of biased data labelling and poor selection of target variables.[109] In addition, unlike traditional software, where outcome is predictable and parameters ascertainable, AI systems, such as a deep neural network, continue to evolve as they learn and improve, resulting in varying outcomes.[110] As previously noted, data used by algorithms to determine repayment potential, transcends traditional client data (such as likelihood of repayment, debt-to-income and loan-to-value ratios, credit history and scores of potential borrowers) to include internet searches, shopping patterns, social media activities, preferences on holidays, hobbies, interests, job-related searches, connections and social activities.[111] This plethora of data points can be detrimental to women's access to credit if the algorithms deem them to be unable to repay loans by interpreting the data incorrectly.

Human developers are responsible for deciding data to be collected and used, how to clean and process of data cleaning as well as what to prioritise and the determination of metrics to measure success.[112] Therefore, getting an objective and representative view entails understanding societal values from the context of the affected class and not just the notion of what is fair as formulated by researchers and ethicists.[113] Authors recommend using principles of fairness to address issues of unrepresentative data, limited resources, poor communication of requirements, improper background research on the problem and language barriers.[114] But fairness is said to be contextual and evolving and could be defined differently depending on goals, subject focus, interest, cost, and available resources in terms of time taken to conduct monitoring, detection, explanation and mitigation.[115]

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105 Busuioc at 829.
106 Dastin J 'Amazon scraps secret AI recruiting tool that showed bias against women'.
107 Ibid.
108 Gsenger R and Strle T 'Trust, Automation Bias and Aversion: Algorithmic Decision-Making in the context of Credit Scoring' at 542–560.
109 Raub M 'Bots, Bias and Big Data: Artificial Intelligence, Algorithmic Bias and Disparate Impact Liability in Hiring Practices' 547–548.
110 See Mandal.
111 Lui and Lamb at 279.
112 See Celis.
113 Ibid.
114 Sefala.
115 Kypraiou S 'What is Fairness?'.

While AI engenders benefits of speed and efficiency, the bias challenge foisted on consumers, (in this case, women) should not be allowed to endure. Regulators need therefore the toolkit to navigate these challenges. The UNESCO 'Recommendation on the Ethics of Artificial Intelligence' proposes due diligence and oversight to identify, prevent and mitigate negative AI impact on inclusive societies.[116] The following section attempts to fill up this toolkit with solutions which could bring regulators closer to dismantling the gender-bias hurdle.

6.7 Navigating artificial intelligence bias in consumer-credit transactions

Understanding the broad legal, ethical and practical considerations for harnessing the benefits of AI in digital consumer-credit systems while minimising gender bias is critical. Discussed under seven themes around feminist outlook, industry collaboration, transparency, data protection, consumer empowerment, AI capacity building and financial and digital literacy, this section outlines ways to achieve less bias in digital consumer credit.

6.7.1 *Adopt a feminist approach and human oversight to the application of artificial intelligence*

AI systems should be designed to welcome women.[117] This should be the focus at all stages of AI design, adoption and usage. Developers and FSPs that utilise AI systems to determine creditworthiness must strive to ensure that the data fed to algorithms do not embody gender substitutes that might reveal gender and in turn reduce women's chances at accessing credit. They should also utilise comparable parameters such as a steady income, accepting alternative proof of collateral including records of consistent payment of home or business rent, mobile subscriptions, and debt repayment to creditors,

When dealing with unrepresentative data, AI use should be designed to achieve better representation.[118] It is also noteworthy that 'big data and data science are overwhelmingly based on white, male, and techno-heroic narratives' and adjusting data collection methods will not be easy as this will mean confronting existing power structures.[119] Again, developer subjectivity in determining what to prioritise may ignore good gender data if the political will to include it is lacking.[120] Efforts need to be geared towards understanding the reasons for the gaps in available data and the exclusion of good gender data to prioritise strategies to ensure better 'data availability, quality, and accessibility'.[121] Equal and diverse female representation in the co-creation, design, and coding of the technology is also supported to require investment and better strategies for skills acquisition.[122]

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116 'Recommendation on the Ethics of Artificial Intelligence' at 26.
117 Robin N 'Workforce diversity can help banks mitigate AI bias' at 2.
118 Kelly and Mirpourian at 14.
119 Pittman A, Appel D and Open Data Watch 'Feminist Data Collection: Building a Vision of an Inclusive System'.
120 Cookson T, Berryhill A and Kelleher D 'Moving from Diagnosis to Change'.
121 Ibid.
122 Avil R et al. 'Call to Action'.

Pittman and Appel recommend that to correct the lack of female representation in data collection, deliberate deconstruction of averages by disaggregation, intersectional analysis and the expansion of data sources to include both traditional and untapped inclusive data sources based on feminist principles is needed.[123] The authors assert that questions have to be asked to define problems, determine who decides on data collection and how data is analysed and used.[124] In addition, Tandon proposes feminist principles such as reflexivity, participation, intersectionality and working towards structural change as a guide for framing for impactful AI deployment and to avoid sharpening inequalities and bias.[125]

Avila et al call for algorithms that correct bias from inception by adequate problem definition and solution design that embodies fairness, accountability and transparency for algorithmic decision making as well as one that considers societal values and feminist contexts.[126] Data monitoring to eliminate bias should not stop at the input phase when training data is introduced. Rather, a continuous review process is needed so that as algorithms learn, a human actor assumes the responsibility of monitoring and fine-tuning the outcome of algorithm decisions to engender neutrality and fairness. These human actors would not only observe and modify outcomes but help the algorithms to understand context.

6.7.2 *Foster transparent processes*

In recognition of AI's esotericism that obfuscates understanding for the average citizen, increased transparency by companies about the development and use of AI, as well as systematic assessment and monitoring of the effects of AI systems to identify and mitigate risks, has been suggested.[127] The UNESCO 'Recommendation on the Ethics of Artificial Intelligence' proposes as a principle, the need for transparency of AI processes to challenge decisions based on AI outcomes provided by the AI systems and avoid infringement of the right to trials and effective remedy.[128] Some authors also recommend that FSPs should utilise accurate training data and engage actively with AI systems, to identify bias and improve transparency and fairness.[129] AI systems should be adequately and independently vetted, and monitored to test and interrogate technical and governance levels of fairness, bias, and transparency from the stage of model testing to validation.[130]

In addition, since AI's internal processing is usually opaque and complex, it is crucial to understand the logic behind AI system outcome to aptly question or challenge outcomes.[131] Ability to explain AI outcomes aids greater visibility of flaws in the system and could improve performance and control.[132] Explainability, which entails providing

123 Pittman, Appel and Open Data Watch.
124 Ibid.
125 Tandon A 'Practicing Feminist Principles in AI Design AI can serve to challenge social inequality and dismantle structures of power'.
126 Avila et al.
127 'Artificial intelligence risks to privacy demand urgent action'.
128 'Recommendation on the Ethics of Artificial Intelligence' at 22.
129 Robin at 1.
130 Busuioc at 833.
131 Ibid. at 830.
132 Johnson K, Pasquale F and Chapman J 'Artificial Intelligence, Machine Learning, and Bias in Finance: Toward Responsible Innovation' at 523–524.

insights of the outcome of AI systems, helps to understand the input, output and functioning of algorithm building blocks and how each contributes to the outcomes of the systems.[133] Transparency and ethical impact assessment have also been proposed and can be achieved by constituting multidimensional, multicultural and multistate, pluralistic and inclusive collaboration to establish oversight mechanisms including auditability, traceability and explainability and enable algorithm assessment, data processing and review of AI systems.[134] Scholars suggest that using mechanisms such as deep learning black-box models improve the transparency of AI by using other algorithms.[135]

There are however no one-size-fits-all solutions for mandating transparency in AI systems, particularly in relation to high-stakes decision-making, where reliance on explanation could be misleading.[136] In view of this, complete trust in AI as abstract mathematical algorithms that embodies 'pure, objective and universal truths' should give way to more accountability from AI developers for the algorithms they design.[137] Clearly, the lack of well-defined rules on fixing shortcomings of AI systems, in terms of bias coupled with the difficulty of review by the public due to a lack of transparency, could affect accountability.[138] Authors have therefore called for the sharing of algorithm shortcomings by companies.[139]

6.7.3 *Ensure data-protection safeguards*

Data-protection safeguards also have a role to play in enhancing women's access to credit. The processing of data should be fair and free from bias. Data subjects should be able to demand accuracy in data used to determine their eligibility for loans and also to demand rectification where inaccurate. Data governance also needs to be nuanced when dealing with input and output data compared to training or testing data as it is shown that, while many may be comfortable with the use of their data to train AI for the calculation of credit scores, personalised use for their own data score may be refused.[140] But data accuracy without further vetting should be propositioned with caution as accurate data can prove detrimental.[141] It is shown for instance in a company setting that, while legacy data could be useful for showing the trend of personnel decisions over time, the same will be unsuitable for training human-resources software for future decision-making as this will embody bias.[142]

Article 19 of the African Union Convention on Cyber security and Personal Data Protection 2014 upholds the right to data rectification and erasure. By this article, a data subject has the right to demand that a data controller rectifies, completes, updates, blocks or erases personal data that are inaccurate, incomplete, equivocal or out of date or whose collection, use or disclosure are prohibited. Similarly, article 13 provides that

133 'Recommendation on the Ethics of Artificial Intelligence' at 22.
134 Ibid. at 26.
135 Busuioc at 830.
136 Ibid. at 831.
137 UNESCO: 'Artificial Intelligence and Gender Equality: Key findings of UNESCO's Global Dialogue' at 9.
138 Sefala.
139 Ibid.
140 Wendehorst.
141 Ibid.
142 Ibid.

data controllers must keep data complete and accurate and take all reasonable steps to erase or rectify data that do not conform to this standard. In the sphere of women's access to credit, women through their rights groups could demand that FSPs as data controllers keep loan-determining algorithms free of inaccuracies that reduce women's success at obtaining loans.

However, to get the benefits of these provisions, more African countries would need to accede to the Convention or develop national legislation that extend these rights. So far, of the 55 African countries, 14 have ratified and only 8 have deposited their instruments.[143] However, about 61 % of African countries have data protection legislation in force with varying provisions.[144] In some countries, the legislation goes beyond the erasure or rectification requirement for inaccurate or incomplete records to include the right to object to automated decision-making by machines.

For example, the Nigeria Data Protection Regulations 2019 (NDPR), enables as a right that a data subject must be provided with information on the existence of automated decision-making, including profiling and the meaningful information about the logic, significance and envisaged consequences of such processing.[145] Thus, borrowers in Nigeria who have been declined a loan, can assert the right to obtain information from FSPs that utilise AI to determine creditworthiness, including algorithm reports that formed the basis of a loan decline. The enforceability of this provision, particularly in the context of digital credit, would have to be established to be effective.

6.7.4 *Set best-practice standards through trans-disciplinary collaboration*

A trans-disciplinary approach to designing AI systems is crucial. This should encompass a diverse team of experts in the value chain of AI, including engineers, AI coders, proprietors, computer scientists, researchers, regulators, consumer advocates and consumers. A multi-stakeholder structure can serve as a think tank to brainstorm benchmarks and monitor and call out bad actors applying objectionable practices. This collaboration could also serve as a good forum for the introduction and promotion of best practices that serve as technical standards for AI developers.[146] AI literacy can also be promoted within these groups which is critical to teaching developers and policymakers about the optimisation of AI for universal good.

The roles of all AI actors within the group require clear definition.[147] AI training data sets should be available and responsibly shareable with the wider AI community, making them central to AI development research and innovation.[148] Furthermore, the principles of explainability, safety, security, privacy, fairness, and human agency oversight should be emphasised.[149] Ethical standards need to be prioritised and regular audit and review iterations emplaced to dislodge balance. Nakatumba-Nabende

143 AU: 'List of Countries which have signed, ratified/acceded to the African Union Convention on Cybersecurity and Personal Data Protection'.

144 UNCTAD: 'Data Protection and Privacy Legislation Worldwide'.

145 Nigeria Data Protection Regulations, 2019 art. 3.1(7).

146 De Siles EL 'Artificial Intelligence Bias and Discrimination: Will We Pull the Arc of the Moral Universe towards Justice?' at 530.

147 Council of Europe: 'Unboxing Artificial Intelligence: 10 steps to protect Human Rights Commissioner for Human Rights' at 9.

148 Nakatumba-Nabende J 'Leveraging AI'.

149 Anneroth M 'AI bias and human rights: Why ethical AI matters'.

recommends a bottom-up approach from inception that considers the cultures, lives, communities and context that data represents, and the ethical considerations and implications of data collection.[150] Language should be standardised to expunge gender identifiers that serve as precursors to gender bias.

6.7.5 *Consumer empowerment*

Consumer empowerment is imperative to developing trust in AI digital credit systems. Some authors suggest that AI developers and FSPs require training on fair treatment of customers, data protection and equality laws to build consumer trust and confidence in AI and to promptly resolve issues.[151] In the interest of consumer protection, AI actors are also enjoined to entrench the principles of accountability and fair lending and provide clients with reasons for the denial of their loan applications as well as the steps that could lead to a successful loan-application outcome next time around.[152]

Consumers also require the assurance of affordable and convenient channels of redress when AI decisions are prejudicial, including online resolution channels. Concerning requirements for offering credit, FSPs need to ensure women do not continue to fall behind by requesting conditions that are suited to the peculiarities of female borrowers.[153] Alternative requirements such as guarantees from social groups, group lending, reliance on business and credit repayment track record, acceptance of moveable assets and warehouse receipts have been suggested.[154] Acceptable collateral could also be expanded beyond immovable assets and big-business track record to include livestock, economic trees and jewellery which more women, particularly those with little economic means, are more likely to own.

Care should be taken in informal lending scenarios such as rotating savings clubs that have benefitted previously marginalised women. As these services become a part of the offerings of banks such as FNB, Nedbank and Capitec in South Africa and Fidelity and Diamond Bank in Ghana and Nigeria respectively, it is important to ensure the preservation of these models and stave off the exacerbation of predatory micro-lending, particularly for women in the informal sectors.

6.7.6 *Build artificial intelligence capacity*

There needs to be capacity building around the development and application of AI, both in terms of gender balance and geographical spread of developers. Statistically, only 22 % of ML researchers are women and only 2 (Kenya and Tunisia) out of 55 African Union (AU) Member States have AI Strategies.[155] Again, a significant percentage of the AI training data is developed outside of Africa and is not attuned to the African woman's context, with the propensity for exclusion as observed with some facial recognition algorithms that have a hard time recognising women of colour.[156] Increased female participation in the entire value chain of AI is therefore crucial. This calls for more projects like the African Girls Can Code project which is expected to help to

150 See Nakatumba-Nabende.
151 Lui and Lamb at 282.
152 See Ahmed.
153 Braun at 12.
154 Ibid.
155 Kidden at 1.
156 See Rizk.

feminise male-centric geek culture and the South African Code4CapeTown that hosts female coders to galvanise female participation in AI.[157] In addition, a diverse workforce that ensures a wide selection of inputs and covers diverse social structures is imperative.[158]

Computer scientists, ML experts, data scientists and mathematicians, social scientists, ethnographers, economists, and citizens have been recommended to be drawn together to address the systemic gender disparities.[159] To this list, Kraft-Bauchman adds ML specialists, engineers, gender specialists, anthropologists, political scientists, social workers, behavioural economists, philosophers, psychologists and activists.[160] These persons would proactively describe, mitigate and correct data bias using appropriate technology.[161] According to Mandal, 'the concepts of bias and fairness from the social sciences need to be modified and applied to the testing and benchmarking techniques of computer science and software engineering to create benchmarks and metrics for AI systems'.[162]

6.7.7 *Financial and digital literacy*

Financial and digital literacy can help women to navigate financial services and become more assertive in enforcing infringed rights. The increased participation of women in digital credit will increase data visibility and ensure that even with the use of AI to determine loan eligibility, fair, accurate and proportionate decisions can be reached.

The UNESCO 'Recommendation on the Ethics of Artificial Intelligence' calls for awareness and literacy which entails that AI technologies and the value of data are promoted by broad stakeholder groups through open and accessible education, civic engagement, digital skills and AI ethics training, media, and information literacy and training.[163] Furthermore, in the policy area of education and research, the Recommendation proposes adequate AI literacy education to the public on all levels to empower people and reduce the digital divides and digital access inequalities resulting from the wide adoption of AI systems.[164] Member States are enjoined to 'promote the acquisition of "prerequisite skills" for AI education, such as basic literacy, numeracy, coding and digital skills, and media and information literacy, as well as critical and creative thinking, teamwork, communication, socio-emotional and AI ethics skills'.[165]

6.8 Conclusion

This chapter examined gender bias in the sphere of AI-based digital consumer credit transactions. It was found that although AI application possesses the capacity to speed up digital credit determination, concerns around gender bias have negative implications for women. As a segment of the population that is historically less favoured by the loan industry, caution must be exercised in basing loan decisions purely on AI

157 Ibid.
158 See Anneroth.
159 Avila et al.
160 See Kraft-Buchman.
161 Ibid.
162 See Mandal.
163 'Recommendation on the Ethics of Artificial Intelligence' at 23.
164 Ibid. at 33.
165 Ibid.

systems to avoid extending existing bias to the digital space. Adopting a feminist approach to developing AI systems, driving industry collaboration and transparency, ensuring data protection, empowering consumers, expanding AI capacity to include more women and ensuing financial and digital literacy are suggested as tools to surmount the gender bias challenge. These tools could change the narratives around lending to women and thus help to improve women's access to credit.

6.9 References

ADB: 'African Development Bank provides $1 million for AI-based national customer management systems in Ghana, Rwanda and Zambia' (10 March 2021) <https://www.afdb.org/en/news-and-events/press-releases/african-development-bank-provides-1-million-ai-based-national-customer-management-systems-ghana-rwanda-and-zambia-42602> (accessed 12 January 2022).

Ahmed S 'A Gender perspective on the use of Artificial Intelligence in the African FinTech Ecosystem: Case studies from South Africa, Kenya, Nigeria, and Ghana' (9 June 2021) <https://researchictafrica.net/wp/wp-content/uploads/2021/07/Final-Revised-AI4D-Gender-ITS-conference-paper.pdf> (accessed 12 January 2022).

Akiba: 'About Akiba' <https://www.akibadigital.com/about> (accessed 4 March 2022).

Anneroth M 'AI bias and human rights: Why ethical AI matters' (10 November 2021) <https://www.ericsson.com/en/blog/2021/11/ai-bias-what-is-it> (accessed 1 March 2022).

'Artificial intelligence risks to privacy demand urgent action' *Bachelet* <https://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=27469&LangID=E> (accessed 20 February 2022).

AU: 'List of Countries which have signed, ratified/acceded to the African Union Convention on Cybersecurity and Personal Data Protection' <https://au.int/sites/default/files/treaties /29560-sl-AFRICAN%20UNION%20CONVENTION%20ON%20CYBER%20SECURITY%20 AND%20PERSONAL%20DATA%20PROTECTION.pdf> (accessed 4 March 2022).

Avil R et al. 'Call to Action' <https://feministai.pubpub.org/pub/call-to-action/release/1?reading Collection=c218d365> (accessed 10 November 2022).

Benthall S and Vilijoen S 'Data Market Discipline: From Financial Regulation to Data Governance' (2021) 8 *Journal of International & Comparative Law* at 459 and 462–464.

Bill & Melinda Gates Foundation 'A G7 Partnership for Women's Digital Financial Inclusion in Africa' July 2019 8 <http://www.g8.utoronto.ca/finance/2019-Gates%20Foundation%20DFI%20Report_ENG.pdf> (accessed 19 January 2022).

Branch: 'Frequently Asked Questions' <https://branch.com.ng/faq> (accessed 5 March 2022).

Braun G 'Policy Brief: Advancing African Women's Financial Inclusion' (July 2012) <https://www.mfw4a.org/sites/default/files/resources/Advancing%20Womens%20financial%20inclusion%20Final%20English.pdf> (accessed 19 February 2022).

Busuioc M 'Accountable Artificial Intelligence: Holding Algorithms' to Account *Leiden University Public Administration Review* (September/October 2021) Vol. 81 Issue 5 831.

Carboni I et al. 'Connected Women: The Mobile Gender Gap Report 2021' *GSMA* 7 <https://www.gsma.com/r/wp-content/uploads/2021/07/The-Mobile-Gender-Gap-Report-2021.pdf> (accessed 12 January 2022).

Carman M and Rosman B 'Applying a principle of explicability to AI research in Africa: should we do it?' *Ethics and Information Technology* (11 May 2020) Springer Nature B.V. 2020 (2021) 23: 107–117 at 113 <https://doi.org/10.1007/s10676-020-09534-2> (accessed 14 February 2022).

Cataleta MS & Cataleta A 'Artificial Intelligence and Human Rights, an Unequal Struggle' *CIFILE Journal of International Law* (2020) Vol. 1 No. 2 40–63.

Celis E 'Debiasing the Algorithm' <https://feministai.pubpub.org/pub/debiasing-the-algorithm/release/1?readingCollection=c218d365> (accessed 10 November 2022).

Chapman JE 'Fintech: Is the Water Fine?' (2021) 8 *Journal of International & Comparative Law* 449.

Cheng L, Varshney K and Liu H 'Socially Responsible AI Algorithms: Issues, Purposes, and Challenges' *Journal of Artificial Intelligence Research* 71 (August 2021) 1145.

Cookson T, Berryhill A and Kelleher D 'Moving from Diagnosis to Change' <https://feministai.pubpub.org/pub/from-diagnosis-to-change/release/1?readingCollection=c218d365> (accessed 10 November 2022).

Council of Europe: 'Unboxing Artificial Intelligence: 10 steps to protect Human Rights Commissioner for Human Rights' (2019) <https://rm.coe.int/unboxing-artificial-intelligence-10-steps-to-protect-human-rights-reco/1680946e64> (accessed 1 March 2022).

Dastin J 'Amazon scraps secret AI recruiting tool that showed bias against women' <https://www.reuters.com/article/us-amazon-com-jobs-automation-insight-idUSKCN1MK08G>.

De Siles EL 'Artificial Intelligence Bias and Discrimination: Will We Pull the Arc of the Moral Universe towards Justice?' (2021) 8 *Journal of International & Comparative Law* 513.

Deloitte: 'Fintech in Nigeria and the Women who Lead' (2019) <https://www2.deloitte.com/ content/dam/Deloitte/ng/Documents/financial-services/ng-fintech-in-Nigeria-and-the-women-who-lead-29032019.pdf> (accessed 12 January 2022).

Deloitte: 'The New Physics of Financial Services: How Artificial Intelligence is Transforming the Financial Ecosystem' <https://www2.deloitte.com/content/dam/Deloitte/uk/Documents /financial-services/deloitte-uk-world-economic-forum-artificial-intelligence-summary-report.pdf> (accessed 27 January 2022).

Durkheimer M 'Millennial Men More Likely than Women to Default on Student Debt' *Forbes* (25 September 2017) <https://www.forbes.com/sites/michaeldurkheimer/2017/09/25/millennial-men-more-likely-than-women-to-default-on-student-debt/?sh =7798ed7e9ea8> (accessed 22 January 2022).

Enhancing Financial Innovation and Success: Fintech Report 'Overview and lessons learnt from global fintech landscape and Nigerian fintech landscape' (18 December 2018) <https://www.efina.org.ng/wp-content/uploads/2019/04/EFInA-FinTech-Report-Global-and-Nigeria-Landscape.pdf> (accessed 19 December 2021).

Floridi L, Seng M and Lee A 'Algorithmic Fairness in Mortgage Lending: from Absolute Conditions to Relational Trade-offs Springer Minds and Machines' (2021) 31:165–191 165 <https://doi.org/10.1007/s11023-020-09529-4> (accessed 6 January 2022).

Gsenger R and Strle T 'Trust, Automation Bias and Aversion: Algorithmic Decision-Making in the context of Credit Scoring' *Interdisciplinary Description of Complex Systems* 19(4) (2021) 552.

Johnson K and Reyes C 'Exploring the Implications of Artificial Intelligence' (2021) 8 *Journal of International & Comparative Law* 326.

Johnson K, Pasquale F and Chapman J 'Artificial Intelligence, Machine Learning, and Bias in Finance: Toward Responsible Innovation' (2019) 88 *Fordham Law Review* 499–524.

Jubraj R Graham T and Ryan E *Redefine Banking with Artificial Intelligence* (2018) <https://www.accenture.com/_acnmedia/pdf-68/accenture-redefine-banking.pdf> (accessed 23 March 2022).

Kagan J 'What is Digital Consumer Credit' (17 May 2021) <https://www.investopedia.com/ terms/c/consumercredit.asp> (accessed 2 April 2022).

Kelly S and Mirpourian M 'Algorithmic Bias, Financial Inclusion, and Gender A primer on opening up new credit to women in emerging economies Women's World Banking' 12 February 2021 <https://www.womensworldbanking.org/wp-content/uploads/2021/02/2021_Algorithmic_ Bias_Report.pdf> (accessed 28 March 2022).

Kidden S 'Gender and Artificial Intelligence Readiness in Africa: Can new technological innovations address an unequal playing field' Research ICT Africa Policy Brief (4 December 2019) <https://researchictafrica.net/wp/wp-content/uploads/2020/11/RANITP2019-4-AI-Gender .pdf> (accessed 4 March 2022).

Kimani M 'Banking on African women: Loan guarantees and private partners improve access' *Africa Renewal* January 2009 <https://www.un.org/africarenewal/magazine/january-2009/banking-african-women> (accessed 13 February 2022).

Kraft-Buchman C 'We Shape Our Tools, and Thereafter Our Tools Shape Us' <https://feministai.pubpub.org/pub/we-shape-our-tools/release/3?readingCollection=c218d365> (accessed 10 November 2022).

Kypraiou S 'What is Fairness?' <https://feministai.pubpub.org/pub/what-is-fairness/release/1? readingCollection=c218d365> (accessed 20 October 2022).

Leavy S 'Gender Bias in Artificial Intelligence: The Need for Diversity and Gender Theory in Machine Learning' paper presented at the 2018 ACM/IEEE 1st International Workshop on Gender Equality in Software Engineering.

Lin TC 'The New Financial Industry' *Alabama Law Review* 65(3) (2014) 567.

Lui A and Lamb GW 'Artificial intelligence and augmented intelligence collaboration: regaining trust and confidence in the financial sector' *Information & Communications Technology Law* 27:3 (2018) 276.

Madgavkar A 'A conversation on artificial intelligence and gender bias' Podcast by McKinsey Global Institute (7 April 2021) <https://www.mckinsey.com/featured-insights/asia-pacific/a-conversation-on-artificial-intelligence-and-gender-bias> (accessed 4 March 2022).

Mandal A 'The Algorithmic Origins of Bias Why is AI biased? Is it designed to be biased or is it an unintentional flaw in the system?' <https://feministai.pubpub.org/pub/the-algorithmic-origins-of-bias/release/3?readingCollection=c218d365> (accessed 4 November 2022).

Mipango: 'Overview' <https://www.f6s.com/mipango> (accessed 4 March 2022).

Monk H ‘International Women’s Day: Addressing gender bias in AI’ (8 March 2022) <https://www.finextra.com/the-long-read/359/international-womens-day-addressing-gender-bias-in-ai> (accessed 2 March 2022).

Morsy H, El-Shal A and Woldemichael A ‘Women Self-Selection out of the Credit Market in Africa’ <https://www.afdb.org/sites/default/files/documents/publications/wps_no_317_women_self-selection_out_of_the_credit_market_in_africa.pdf> (accessed 9 November 2022).

Nakatumba-Nabende J ‘Leveraging AI’ <https://feministai.pubpub.org/pub/leveraging-ai/release/ 1?readingCollection=c218d365> (accessed 1 March 2022).

Nickie MH *How Artificial Intelligence Affects Financial Consumers* (2019) <https://www.brookings.edu/research/how-artificial-intelligence-affects-financial-consumers/> (accessed 23 February 2022).

OECD: ‘Do women have equal access to finance for their business?’ <https://www.oecd. org/gender/data/do-women-have-equal-access-to-finance-for-their-business.htm> (accessed 12 January 2022).

Pessach D and Elsevier ES ‘Improving fairness of artificial intelligence algorithms in Privileged-Group Selection Bias data settings’ 185(2021)115667 1

Pittman A, Appel D and Open Data Watch ‘Feminist Data Collection: Building a Vision of an Inclusive System’ <https://feministai.pubpub.org/pub/feminist-data-collection/release/1?readingCollection=c218d365> (accessed 10 November 2022).

Qureshi F, Rea SC and Johnson KN ‘(Dis) Creating Claims of Financial Inclusion: The Integration of Artificial Intelligence in Consumer Credit Markets in the United States and Kenya’ (2021) 8 *Journal of International & Comparative Law* 405–427.

Raub M ‘Bots, Bias and Big Data: Artificial Intelligence, Algorithmic Bias and Disparate Impact Liability in Hiring Practices’ (2018) 71 *Ark Law Review* 529.

Richardson R, Schultz J and Crawford K ‘Dirty Data, Bad Predictions: How Civil Rights Violations Impact Police Data, Predictive Policing Systems, and Justice’ *New York University Law Review Online* (2019) 192.

Rizk N ‘AI and Gender in Africa’ <https://openair.africa/ai-and-gender-in-africa/?> (accessed 12 November 2022).

Robin N ‘Workforce diversity can help banks mitigate AI bias’ *American Banker* (31 May 2018) Vol. 183 No. 104 2 <gale.com/apps/doc/A540845695/AONE?u=unict&sid=bookmark-AONE&xid=21ae20bb> (accessed 20 February 2022).

Sefala R ‘A view from another set of eyes’ <https://feministai.pubpub.org/pub/a-view-from-another-set-of-eyes/release/1?readingCollection=c218d365> (accessed 11 November 2022).

Sigler W ‘Women handle loans better than men: Key trends across auto, personal loan segments’ (9 March 2020) <https://www.financialexpress.com/money/women-handle-loans-better-than-men-key-trends-across-auto-personal-loan-segments/1893360/> (accessed 14 March 2022).

Singh C and Lin W ‘Can artificial intelligence RegTech and CharityTech provide effective solutions for anti-money laundering and counter-terror financing initiatives in charitable fundraising’ *Journal of Money Laundering Control* Vol. 24 No. 3 (2021) 474.

Smith G and Rustagi I ‘When Good Algorithms Go Sexist: Why and How to Advance AI Gender Equity’ *Stanford Social Innovation Review* (31 March 2021) <https://ssir.org/articles/entry/ when_good_algorithms_go_sexist_why_and_how_to_advance_ai_gender_equity> (accessed 14 February 2022).

Sovtech: ‘How is AI Being Used in the African Fintech Industry?’ *Business Technology* (2019) <https://www.sovtech.co.za/ai-in-african-fintech-industry/> (accessed 16 March 2022).

Sterling Bank: ‘Welcome to Specta’ <http://myspecta.com/> (accessed 5 March 2022).

Tala: ‘Tala <https://tala.co/about/> (accessed 14 March 2022).

Tandon A ‘Practicing Feminist Principles in AI Design AI can serve to challenge social inequality and dismantle structures of power’ <https://feministai.pubpub.org/pub/practicing-feminist-principles/release/2?readingCollection=c218d365> (accessed 10 November 2022).

Toesland F ‘Finance gender gap costs Africa $95bn per year’ (8 March 2022) <https://african. business/2022/03/finance-services/finance-gender-gap-costs-africa-95bn-per-year/> (accessed 24 March 2022).

UNCTAD: ‘Data Protection and Privacy Legislation Worldwide’ <https://unctad.org/page/data-protection-and-privacy-legislation-worldwide> (accessed 4 March 2022).

UNESCO: ‘Artificial Intelligence and Gender Equality: Key findings of UNESCO’s Global Dialogue’ (August 2020) <https://en.unesco.org/system/files/artificial_intelligence_and_gender_ equality.pdf> (accessed 3 March 2022).

UNESCO: ‘Recommendation on the Ethics of Artificial Intelligence’ (2021) https://www.unesco.org/en/artificial-intelligence/recommendation-ethics (accessed 10 November 2022).

Wellner G and Rothman T ‘Feminist AI: Can We Expect Our AI Systems to Become Feminist?’ *Springer Nature B.V. 2019 Philosophy & Technology* (2020) 33:191–205.

Wendehorst C et al. ‘Data Governance Working Group A Framework Paper for GPAI’s work on Data Governance November 2020’ <https://gpai.ai/projects/data-governance/gpai-data-govern ance-work-framework-paper.pdf> (accessed 9 November 2022).

Zhang D et al. ‘The AI Index 2022 Annual Report’ AI Index Steering Committee, Stanford Institute for Human-Centered AI, Stanford University (March 2022) <https://aiindex.stanford.edu/wp-content/uploads/2022/03/2022-AI-Index-Report_Master.pdf> (accessed 19 January 2022).

Zintle ‘3 Technologies that are Reshaping the Banking Industry in Africa’ (10 March 2022) <https://www.itnewsafrica.com/2022/03/3-technologies-that-are-reshaping-the-banking-industry-in-africa/> (accessed 19 March 2022).

Chapter 7

Beyond intellectual property protection: Other artificial intelligence intellectual property strategies for the African context*

7.1 Introduction

The significance of intellectual property (IP) to artificial intelligence (AI) has been widely recognised. IP has played and continues to play a prominent role in the development and deployment of AI in many parts of the world, including on the African continent.[1] As systems to protect creative and inventive outputs, the relevance of IP rights (IPRs) to AI is not in doubt.[2] Indeed, the discourse on AI and IP is focused on viewing AI from two key aspects/perspectives: as legal objects and as legal subjects.[3] As legal objects, AI systems are conceptualised or envisaged as tools with which specific objectives and specific tasks are achieved and undertaken respectively. In this regard, legal protection (in this case, IP protection) is sought and acquired for the AI systems or for the AI itself and, perhaps, outputs generated using AI systems. Such IP protection could be patents, copyright or trade secrets that are geared towards protecting the creative or inventive output embodied in the AI system.[4] As legal subjects, AI is perceived (or conceived) as the legal subject or person acquiring rights to or interests in a legal object (that is to say IP-protectable material) or engaging in creative endeavours or taking inventive steps.[5] Both aspects have generated and continue to generate debate across Africa and the world on questions of law and regulations on AI relating to IP protection, ethics, privacy, competition, non-proliferation etc.[6]

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* This work chapter is based on research supported in part by a grant awarded to the author under the University of Pretoria's Research Development Programme. Any opinion, finding and conclusion or recommendation expressed in this material is that of the author and the University of Pretoria does not accept any liability in this regard. I acknowledge Segopotso Gaiketumele's research assistance and the anonymous peer reviewers for their comments.

1 See 'WIPO Begins Public Consultation Process on Artificial Intelligence and Intellectual Property Policy'. See also 'Public Views on Artificial Intelligence and Intellectual Property Policy'.

2 Pillay N *Artificial intelligence for Africa: An opportunity for growth, development, and democratization* at 34–35. See also Gervais D 'The Human Cause'.

3 Lai A 'Artificial Intelligence, LLC: Corporate Personhood as Tort Reform' at 597.

4 Aplin T and Pasqualetto G 'Artificial Intelligence and Copyright Protection' ch. 5; Ballardini RM, He K and Roos T 'AI-generated content: authorship and inventorship in the age of artificial intelligence' at 117–135.

5 Comer A 'AI: Artificial Inventor or the Real Deal?' at 472–473.

6 Ncube C and Rutenberg I 'Intellectual property and Fourth Industrial Revolution technologies 1' at 393.

In the field of IP law, which is the focus of this chapter, these questions (also) recognise and acknowledge both the challenges and opportunities that AI presents for Africa and African countries. Following from this, one popular proposal is to grant IP protection to AI systems and/or AI-generated products.[7] The argument embodied in such proposal is that the statutory monopoly or exclusivity available due to IP protection would incentivise the development of more AI systems and/or tools. However, despite the benefits of such proposals, there is the important question of whether given the development goals and plans set by African countries for themselves, IP protection is necessary or desirable to promote or incentivise the development and deployment of AI systems. As used in this chapter, 'necessity' or 'desirability' means granting or proposing the grant of IPRs to protect or secure AI systems and incentivise further and increased development and deployment of AI in Africa. Necessity or desirability takes for granted the need to incentivise the development and deployment of AI in Africa and only considers whether an IPRs framework is needed or desirable to incentivise these works. This explains the title of this chapter: while the chapter argues that IP protection would be available for AI systems, it implies that the IP *system* is more than just IP protection.[8] The chapter argues, in other words, that the IP system embodies other components that may be better placed to harness the opportunities and overcome the challenges of AI on the continent.

Although relevant examples from other African countries are used, South Africa's National Development Plan 2030 (NDP 2030)[9] is deployed as a backdrop for the analysis. The NDP 2030 embodies greater ownership and political control of the processes leading to its production and has the potential to influence the implementation of development priorities in a more effective way.[10] Unlike the UN Sustainable Development Goals 2030 (SDGs) and the African Union Agenda 2063 which respectively express global and regional commitments and do not mention the peculiarities of any national context and national development challenges, the NDP 2030 explicitly and understandably seeks to address injustices resulting from South Africa's apartheid past.[11] The overarching aim of the NDP 2030 is to eliminate poverty and reduce inequality by 2030.[12] Among the five notable trends indicated in the NDP 2030, technology features as a trend South Africa must understand and respond appropriately to in order to actualise its development goals.[13] On the whole, the NDP 2030 uses a system-based view of technology and innovation emphasising networks, public-private collaborations and regulatory coherence as key for technological advancement.[14] Given the

7 See Gervais.
8 See Chidede T 'The Role of Intellectual Property Rights' Protection in Advancing Development in South Africa' at 175–176, arguing that '[t]he classical thought is that the rationale for protecting IPRs is to establish private rights in creations and innovations to grant control over their exploitation and provide an incentive for further creativity. While this is true, one should not overlook the ultimate goal of the public good – promoting progress for the benefit of society').
9 'National Development Plan 2030: Our future – make it work' (South Africa) (NDP 230).
10 Okitasari M and Katramiz T 'The national development plans after the SDGs: Steering implications of the global goals towards national development planning' at 8.
11 May J 'Integrating Human Rights Approach to Food Security in National Plan and Budget: The South African National Development Plan' ch. 2.
12 NDP 2030.
13 Ibid. at 28.
14 Jegede O and Ncube C 'Science, Technology, Innovation Management for Industrial Development in South Africa: Implications for The Fourth Industrial Revolution' at 680.

context of these national development plans or goals, the pertinent question that this chapter seeks to answer is how best the IP system could be applied to harness the opportunities of AI for Africa. The chapter is premised on the argument that the use of the IP system to take advantage of the opportunities, and overcome the challenges, of AI on the continent should be based on the recognition of the contextual characteristics that exist in the continent as embodied in expressed development plans.

The second part of this chapter takes a brief but closer look at South Africa's NDP 2030, highlighting the role of AI in the actualisation of the development goals. More significantly, this part showcases the contextual characteristics of South Africa as a microcosm of the African continent to show how such context should necessitate a different AI IP policy. It concludes that the imperative for South Africa and other African countries is to facilitate AI applications across all sectors of the economy. Such AI applications in health, education, governance etc. will contribute to Africa's development. The third part of the chapter builds from the preceding section and presents an overview of the varied uses of the IP systems (specifically copyright and patent laws) to promote creativity; inventiveness and innovation. On this basis, this part supports the argument that the grant or conferment of IPRs is not the only way to facilitate investment and innovation in the AI space or to harness the opportunities of AI or address the challenges posed by AI. Rather, the IP system *also* offers scope delineation and exceptions to IP protection that can also (and perhaps better) facilitate investment and innovation in the AI space. The fourth part then proposes strategies within the IP systems that can enable Africa to take advantage of the opportunities, and overcome the challenges, of AI on the continent. Lastly, the fifth part concludes.

7.2 Contextualising artificial intelligence for Africa: South Africa's National Development Plan 2030

In 2012, the South African government launched the NDP 2030 setting out key priorities for South Africa to meet the overarching aim of eliminating poverty and reducing inequality by 2030. The NDP 2030 was built on the basis of a 2011 Diagnostic Report prepared by the National Planning Commission, which sets out a number of challenges that South Africa must address, including the high rate of unemployment, quality of school education, underperforming health system, resource-intensive economy and inequality within the South African society.[15] Building on the report, the NDP 2030 highlighted three priorities viz: 'raising employment through faster economic growth; improving the quality of education, skills development and innovation; and building the capability of the state to play a developmental, transformative role'.[16]

Other literature support this context of South Africa which persists in varying degrees over a decade since the adoption of the NDP 2030. There are still high levels of unemployment and a majority of citizens lack both advanced and basic skills.[17]

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15 See National Planning Commission: Diagnostic Report 2011.

16 See NDP 2030 at 27.

17 Mncayi P and Meyer FD 'Evaluating the Determinants of the Perceptions of Underemployment among Young University Graduates: A South African University case'; Van der Berg S & Gustafsson M 'Educational Outcomes in Post-apartheid South Africa: Signs of Progress Despite Great Inequality' at 25–45; Labour market dynamics survey, 2018; 'Youth still find it difficult to secure jobs in South Africa'; Tewari DD 'Is matric math a good predictor of a

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Government's track record in policy implementation and private sector engagement remains poor.[18] Similarly, government's position on the role of the private sector and the limits of private sector involvement is inconsistent.[19] As Sutherland points out:

> 'In South Africa, the legal and policy frameworks for infrastructure have been problematic, with changes being made slowly, with poor quality drafting and inadequate parliamentary scrutiny of legislation, weak regulation, and excessive reliance on poorly controlled and financed state-owned enterprises (SOEs). In telecommunications, the government failed to make Telkom SA comply with its pro-competitive policies, despite it being both state-owned and regulated. Corruption badly affected the monopoly electricity generator and railway company, while SAA and SABC were made all but bankrupt. Data protection legislation has only recently and partially become operational, after two decades of preparation, leaving it far behind developments in Europe, though still ahead of much of Africa. Cybersecurity has received some attention, but with government adopting overly complex policies and mechanisms for inter-departmental and inter-governmental cooperation, while legislation has made only slow progress. The education system cannot produce sufficient graduates in science, technology, engineering and mathematics (STEM) to meet demand, largely because there are too few appropriately qualified school leavers. Nor are there adequate systems to train and re-train individuals in information and communication technology (ICT) skills. While there has been progress in the creation of technology hubs and financing for start-ups, these have yet to have a significant economic effect.'[20]

The NDP 2030 was adopted as an action plan to address these issues, and to enable the government and the country to take advantage of rapid technological changes.[21] As the introductory chapter of this volume rightly notes, AI may be perceived as powerful computer systems or machines that have through machine learning (ML), neural networks, logic programming and other techniques, developed human-like capabilities over time.[22] The list of opportunities that AI can harness and the challenges that AI can be used to address continue to rise. On the African continent, including in South Africa, AI has presented numerous benefits. In Kenya, AI is being used to address some of the issues that prevent financial institutions from lending to smallholder farmers and to interface with weather conditions to assist farmers with making sowing and harvesting decisions.[23] Across the African continent and the world, AI continues to find diverse use cases in the healthcare sector, enabling better diagnostics and detection and improving access to medical and treatment providers.[24] In the education sector, AI finds application in grading; tutoring including providing assistance through individualised tutoring

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student's performance in the first year of a university degree? A case study of faculty of management studies, University of KwaZulu-Natal, South Africa' at 233–237; De Lange J 'What are the reasons for unemployment in South Africa?'

18 Block D et al. 'The Impact of Poor Policy Implementation by the Government of the Republic of South Africa of Service Delivery'.

19 See Sutherland E 'The fourth industrial revolution – the case of South Africa' at 234. See also Makulilo AB 'The context of data privacy in Africa' at 3–23; Springer C, Bayen, M and Giuliani D 'Africa: A Look at the 442 Active Tech Hubs of the Continent'.

20 See Sutherland at 235.

21 Ibid.

22 See ch. 1 of this book.

23 Pillay at 9.

24 Ibid. at 10.

for learners with learning difficulties.[25] Government and public services are not left out. AI can and has found application in reducing backlogs, lack of accuracy and slow response times in the provision of public services.[26] In the life sciences, it helps practitioners diagnose better and to check the efficacy of drugs.[27]

However, there is another side to AI systems beyond their many benefits. AI systems are considered 'dual use' – capable of being deployed both for beneficial and malign purposes. Apart from its beneficial uses highlighted above, AI systems have the ability to be, and have been, deployed for malign purposes.[28] Not only is AI dual use but it is built in many cases on open source and publicly accessible data.[29] Given its dual use and often open-source nature, AI systems can challenge national security in unprecedented ways. It has been shown that AI-enabled disinformation attacks can be used to create dissent within countries and interference with democratic processes.[30] AI software can be paired with other materials to create 'smart' weapons. Essentially, AI is a weaponisable technology. Placed in the hands of unscrupulous entities, whether deliberately or inadvertently, AI can be used as a tool of or for repression, harm and other malign purposes. Due to its ability to produce and manipulate original content be it text, images, audio and video (for example through deep fakes), AI can be deployed towards information-based operations for good as stated above or for ill (for example to spread malign information or misinformation as seen in the efforts of Russia to undermine US elections).[31] AI can power data analytics in ways that transform the relationship between companies and consumers and between governments and citizens.[32] In this environment, data is the new gold and has been used to deliver targeted ads to consumers.[33] Again, in the hands of malevolent entities, AI-driven analytics can offer a wicked tool for governments to spy on their citizens and on citizens of other countries, threatening their national security in diverse ways.[34]

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25 Ibid. at 14.

26 Ibid. at 11.

27 Manzi J and Scott S 'AI for Life Sciences: What is it Good For?'

28 Jarrahi MH 'In the Age of the Smart Artificial Intelligence: AI's Dual Capacities for Automating and Informating Work' at 180–181; Wilkens U 'Artificial intelligence in the workplace – A double-edged sword' at 255.

29 Eckart de Castilho R et al. 'A Legal Perspective on Training Models for Natural Language Processing'.

30 Okorie CI 'Technology and national security: what's IP got to with it?' at 601–602; Garon JM 'When AI Goes to War: Corporate Accountability for Virtual Mass Disinformation, Algorithmic Atrocities and Synthetic Propaganda' at 181.

31 Polyakova A 'Weapons of the weak: Russia and AI-driven asymmetric warfare'.

32 Pappas IO et al. 'Big Data and Business Analytics Ecosystems: Paving the way towards Digital Transformation and Sustainable Societies' at 484 and 486.

33 Akter S et al. 'Transforming Business using Digital Innovations: The Application of AI, Blockchain, Cloud and Data Analytics' at 15; Noort GV et al. 'Introducing a Model of Automated Brand-Generated Content in an Era of Computational Advertising' at 416.

34 Varianos D and Stavrou G 'Surveillance Infrastructure and Artificial Intelligence: Challenging Democracy and Human Right in China' at 31: presenting evidence of the Chinese Government's use of AI to interfere in the daily lives of citizens and assume control of their information.

AI-generated malware has the ability to change at an alarming rate once deployed on a computer system. This makes cyber-attacks more effective than ever before.[35] Furthermore, due to its enormous potential, AI systems are vulnerable to attack from competitors and other governments.[36] This necessitates the idea of laws and policies to help protect AI systems from such attacks.[37] In the field of biotechnology, AI can be combined with other innovations to provide solutions that improve human health, food production and environmental sustainability.[38] AI can also enable a pathogen to be engineered for lethal purposes.[39] This dual-use nature of AI necessitates a multi-pronged legislative and policy approach within the IP legal framework.

From the foregoing, the perspective of AI that this chapter is focused on and one that is arguably most relevant and more pertinent for the African continent and for the actualisation of the objectives and priorities of the NDP 2030, is AI as tools (so-called AI applications).[40] Essentially, AI is a technology to be understood and leveraged upon for national development. In this regard, the manner in which AI and any other technology is built, introduced, used and/or applied determines its impact and it is imperative to make inventions and innovations available to the public so that people may build on it responsibly.[41] How does AI as tools interact with the IP system? The follow-on question which the third part of this chapter explores, is the details of AI applications/deployment/use and how that interacts with the IP system.

35 Brundage M et al. 'The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation' at 18–20.

36 Moran RC, Burton J & Christou G 'The US Intelligence Community, Global Security, and AI: From Secret Intelligence to Smart Spying' at 11: arguing that spies could be placed in universities to steal IP relating to AI technologies.

37 Comiter M 'Attacking Artificial Intelligence: AI's Security Vulnerability and What Policymakers Can Do About It' at 55.

38 Bedoya GM et al. 'Promising Perspectives on Novel Protein Food Sources Combining Artificial Intelligence and 3D Food Printing for Food Industry' at 44–45; Javaid M et al. 'Understanding the adoption of Industry 4.0 technologies in improving environmental sustainability' at 206-207.

39 Kavanagh C 'New Tech, New Threats, and New Governance Challenges: an Opportunity to Craft Smarter Responses? at 25.

40 'The Commission: (2) urges State Parties to ensure that all AI technologies, robotics and other new and emerging technologies that are imported from other continents are made applicable to the African context and or adjusted to fit Africa's needs, and to give serious consideration to African values and norms in formulation of AI governance frameworks to address the global epistemic injustice that currently exists'. See 473 Resolution on the need to undertake a study on human and peoples' rights and artificial intelligence (AI), robotics and other new and emerging technologies in Africa – ACHPR/Res. 473 (EXT.OS/ XXXI) 2021 – The African Commission on Human and Peoples' Rights (Commission) meeting at its 31st Extraordinary Session held virtually, from 19 to 25 February 2021. See also Duque Lizarralde M and Contreras HA 'The real role of AI in patent law debates' at 23–46. See also Manzi and Scott.

41 Levendowski A 'How copyright law can fix artificial intelligence's implicit bias problem' at 579.

7.3 Artificial intelligence's application to intellectual property law

AI does not exist in a vacuum. It is developed and deployed based on the context of the future, present challenges, and objectives and anticipated goals. Developing or creating AI systems involve building machines that can make decisions to achieve a specific purpose and such machines need a knowledge dataset to do so.[42] The data in/for this dataset range from information (for example, banking history, purchase history etc.) to images to language in text and spoken form.[43] These data are then curated and analysed by AI and for AI tools. Globally, including on the African continent, the challenge with creating and curating this dataset is primarily with data access. IP law – particularly, copyright law is considered as restrictive to data access because many data sources (that is to say, written texts, images, spoken word etc.) are subjects of IPRs. To avoid liability for copyright infringement, AI developers utilise all or any of the following options: use open source and or freely available data,[44] which may be biased; to build systems to collect data and or; purchase data access.[45] However, this poses its own problem of 'implicit bias' in AI systems and applications/use and power concentration in the hands of a few who can purchase data or build systems for data collection.[46] Data access is also a challenge for AI use, which may exacerbate the use of biased data which in turn could result in biased AI tools and AI applications.[47]

Even with the availability of and access to open access data in various knowledge bases, the absence of or low availability of data/text in African languages makes open-access data problematic beyond the general problem of 'implicit bias' arising from open-access works or materials.[48] Beyond the challenge of low quantity and quality of data is the issue of the type of data – African languages are not readily available for use in the development and building of ML systems.[49] The fact that current ML for AI privileges foreign and European languages over African languages exacerbates the inequalities and social exclusion that national development plans such as the NDP 2030 seeks to address.[50] If the IP system is to support the development, use and application of AI in Africa, it must enable data access, data curation and responsible use and application of AI.

Another area of concern is in patent law. Generally, patents are awarded for inventions that are patentable within the meaning of the relevant patent's statute, are novel, involve an inventive step and are capable of industrial application. In making patent applications, applicants must disclose their patent claims, showing technical information that would be used to examine and authenticate those claims.[51] In this regard, patent applications and patent documents generally can signal innovations in AI and

42 Marivate V 'Why African natural language processing now? A view from South Africa' at 3; Brodie ML and Mylopoulos J 'On Knowledge Base Management Systems: Integrating Artificial Intelligence and Database Technologies'.
43 Marivate at 4; Levendowski at 590 and 593–594.
44 Ncube and Rutenberg at 404; Mohamed S 'Raising our voice in artificial intelligence'.
45 Levendoski at 589 and 606–608.
46 Ibid.
47 Levendoski at 583.
48 Marivateat 9. Toyama K 'The internet and inequality' at 28–30; Levendowski.
49 Marivate at 2.
50 Ibid. at 8.
51 See, e.g., South Africa's Patent Regulations, 1978, as amended.

other technologies. Through patent documents, interested members of the public can find technical information regarding innovation in any field.[52] This may then lead to technology transfer transactions, technology exchange arrangements and other forms of business arrangements that permit the acquisition of technology. They could also lead to the disclosure of information that may be deployed for malign purposes.[53] This requires thinking about how the IP system could secure, regulate and manage such disclosures.

In focusing on the foregoing aspects of the IP system, one is mindful of the fact that these aspects are neither the only questions in the debate nor the sole focus of the IP system itself. Even if only in relation to AI applications or using AI as tools, various lines of enquiry emerge. Ncube and Rutenberg highlight such normative questions, such as whether AI-generated inventions should be excluded from patent-eligibility; whether it is necessary to revise patentability criteria; how the originality of AI-generated work should be evaluated; whether the list of works that are eligible for copyright protection should be revised to allow for various forms of AI-generated works etc.[54] In many jurisdictions, patents statutes do not explicitly exclude or include advanced and emerging technologies in its list of patentable inventions, and so, such technologies may be patentable if they meet the three eligibility criteria – if they are new, involve an inventive step and are capable of industrial application.[55] In assessing the presence of these criteria, patent examiners check, among other things, whether or not the claimed invention is obvious to a 'person skilled in the art' within which such invention falls. For AI-generated inventions in particular, it has been suggested that patent examiners need to upgrade their systems to deploy AI in patent examinations as relying solely on human examiners may be challenging for examining such patents. As the US Patent and Trademark Office pointed out, 'AI systems can be trained to analyse patent applications and identify inconsistencies, inaccuracies, or prior art that may render an invention unpatentable [which] can improve the accuracy of patent grants by identifying problematic applications more quickly.'[56] However, in many countries in Africa, there is currently no mechanism in place for substantive examination of patents.[57] Instead, the current patent application system operates as a repository system and patent officials undertake mainly formal examination – assessing patent application for compliance with form and filing requirements.

Beyond innovations that fall within the criteria for IP protection, there are technological and or technical know-how, business secrets etc. that, while valuable, may either not satisfy IP protection criteria or do not fall into the main IPRs. Such know-how may be protected through laws relating to trade secrets, confidential information, and unfair competition. However, explicit trade-secret protection is currently lacking in many African countries. In the absence of specific trade-secret protection laws, it is common practice for parties to enter into non-disclosure agreements, confidentiality agreements

52 See Fromer JC 'Patent disclosure' at 548–551.
53 See Seymore SB 'The teaching function of patents at 621, arguing that, '[b]ecause patents can, at times, communicate knowledge as well as, or better than, other information sources, patents could become a competitive source of technical information'.
54 Ncube and Rutenberg at 399–401.
55 The (Nigeria) Patents and Designs Act s 1; South Africa Patents Act 57 of 1978 s 25(1).
56 Power Patent: 'USPTO Deploys Numerous AI Tools to Aid Patent and Trademark Examination'.
57 Mgbeoji I 'African patent offices not fit for purpose' at 234–247.

and/or non-compete agreements to protect such information or know-how on an ongoing basis or before the disclosure of such information or know-how. There is ample protection of contracts through the courts and other dispute-resolution mechanisms.

In spite of these protections, the perspective of AI as tools to be used across various sectors and aspects of the society in South Africa and everywhere else in Africa is evidently more useful for IP policymakers, allowing them to focus on using the IP system to enable AI applications.[58] Viewed in this light, the IP legal framework becomes a system that contributes to AI development, use and application in a manner that benefits African countries and African societies. Moreover, apart from the fact that the use of AI as tools is more pertinent for the actualisation of the objectives and priorities of the NDP 2030, the question of AI as legal subjects is one for legislative reform at least from the perspective of authorship, inventorship and ownership (and the consequent enjoyment) of IPRs. This is so because the current IP statutes and, even, national constitutions do not presently stipulate (or envisage) non-natural and non-juristic persons as authors or inventors.[59] The same goes for AI-generated outputs in many respects. As recent as 2021, when South Africa's Companies and Intellectual Property Commission (CIPC) awarded a patent for an invention that names an AI system as inventor,[60] the debate was around the issue of whether the relevant IP laws such as copyright and patent laws in Africa and elsewhere permit and or envisage non-human authors or inventors.[61] In this regard, several scholars have pointed out that the copyright and patent legal frameworks are not currently designed to recognise AI as authors in the case of copyright works or as inventors or person skilled in the art in the case of patentable inventions.[62] Others have gone as far as arguing that even if the current IP framework could be expanded or interpreted to accommodate AI as authors or inventors, the IP framework should not.[63] Yet, for other groups, companies (and non-humans such as AI) can be inventors and authors because corporations are the users of trade secrets, owners and users of trademarks, and authors for certain works created by their employees or which they made arrangements for etc.[64]

More importantly, the real issue of concern presently is, or should be, how the IP system can promote the use of AI as a tool for national development. As seen from other jurisdictions (and continents), IP rulemaking when it comes to AI, has become a

58 Sutherland at 246.
59 Okorie C 'Artificial Intelligence Systems as Inventor in South African patent system: The case of DABUS'; Oriakhogba DO 'What If DABUS Came to Africa? Visiting AI Inventorship and Ownership of Patent from the Nigerian Perspective' at 89–99; Oriakhogba DO 'DABUS gains territory in South Africa and Australia: Revisiting the AI-inventorship question' at 87–108.
60 Business Insider: 'SA becomes the first country in the world to award a patent to an AI-generated invention'.
61 Oriakhogba 'DABUS gains territory in South Africa and Australia' at 87–108; Okorie 'Artificial Intelligence Systems as Inventor in South African patent system'.
62 George A and Walsh T 'Artificial intelligence is breaking patent law' at 616–617; Oriakhogba 'DABUS gains territory in South Africa and Australia' at 87–108.
63 Gervais.
64 Crouch D 'Legal fictions and the corporation as an inventive artificial intelligence'; Scannell B 'When Irish AIs are smiling: could Ireland's legislative approach be a model for resolving AI authorship for EU member states?' at 727–740; Thaldar D and Naidoo M 'AI inventorship: The right decision?' at 1–3.

question of political ideology. Different jurisdictions are also now competing on regulatory and governance frameworks on AI and the role of IP is a particular area of focus and interest. The next part attempts a response to this follow-on question of how those IP systems may be deployed to make AI work for the African continent.

7.4 *I ma nju oguga; ju ochicha:* Intellectual property should not restrict innovations in artificial intelligence

Having established the link between AI and specific areas of copyright, patents and (in more limited fashion) trade secret laws as well as the IP law challenges that derail Africa from harnessing the benefits of AI and challenges posed by AI to Africa's context, this section suggests how those IP systems may be deployed to make AI work for the African continent.

Sometimes a system can do more by getting out of the way than by trying to actively undertake specific tasks. This is the sentiment behind the Igbo language adage, '*i ma nju oguga; ju ochicha*' (literal translation: You cannot refuse to move and also refuse to get out of the way). IPRs/protection are only one part of the IP system. Copyright law is about a bundle of exclusive rights granted to authors and owners of designated protectable subject matters. It is also about the scope of the rights, the scope of the designated protectable subject matters and the exceptions to the application of the exclusive rights.[65] In the same vein, patents law is about both the exclusive rights of patentees and the exceptions and limitations to the scope of those exclusive rights.[66] By extension, the grant of IPRs or protection to AI as tools is not the only way (and may not be the most appropriate way) for Africa to take advantage of the opportunities, and overcome the challenges, of AI on the continent.[67]

Apart from granting a bundle of exclusive rights to authors and/or copyright owners, copyright law has certain inbuilt mechanisms to promote access to copyright-protectable subject matter which may constitute data for AI development. These mechanisms are in the form of copyright limitations and exceptions which may be applied to several purposes from promoting authorship, protecting consumer interests, fulfilling social policy goals to fostering innovation, and addressing market failure problems.[68] Already, the fair-use doctrine that holds sway in the US has been proposed as a panacea to address data access and implicit bias in data for AI development. Arguing that AI's use of data meets all the relevant factors to determine if a particular use of protectable subject matter is fair, many scholars argue that the fair-use doctrine can help solve the AI bias problem by increasing AI's access to more (and varied) data.[69] Levendowski suggests that the US fair-use doctrine is one area of copyright law that may be applied successfully to address concerns of data access in the context of AI.[70] Within South Africa, such proposals are used to provide support for recommending the adoption of a US-style fair-use copyright exception within the current copyright

65 Elkin-Koren N 'Copyright in a digital ecosystem: a user-rights approach' at 132–168.
66 Jegede and Ncube at 682–683 and 686.
67 Ibid. at 682–683.
68 Samuelson P 'Justifications for Copyright Limitations & Exceptions' at 12–59.
69 Levendowski at 622–629. Ncube and Rutenberg at 404; Mohamed.
70 Levendoski at 589.

statutory reform process.[71] Beyond the statutory amendment process, South Africa's Constitutional Court recently issued a decision that exemplifies how copyright exceptions could address data-access issues. In *Blind SA v Minister of Trade, Industry and Competition and Others*,[72] the Constitutional Court confirmed that to the extent that the Copyright Act[73] does not permit the reproduction and adaptation of copyright-protected literary and artistic works in accessible format for the use of visually impaired persons, it was unconstitutional. The Constitutional Court further directed the reading in of a new section 13A into the Copyright Act. Section 13A is geared towards making specified copyright-protected works available to persons with visual disabilities. It defines 'accessible format copy' to mean a copy of a work that gives visually impaired persons access to the work as 'feasibly and comfortably' as a person without such disability and envisages only literary works and artistic works forming part of a literary work.[74] While the Constitutional Court decision focuses specifically on visually impaired persons, there are elements in the larger picture of the Copyright Amendment Bill in South Africa to suggest that permitting the making of accessible format copy may become a norm that will benefit South Africa, including and even in the AI space. As Marivate points out, a practice as simple as publishing documents in plain text as opposed to PDFs can make it more accessible to machines and not just humans.[75]

AI is open innovation with firms using both external and internal ideas and know-how in its development and deployment,[76] and this manner in which AI is developed, used and applied is important. If the IP system is to address the dual-use nature of AI and help prevent its malevolent development, use and application in Africa, it must be applied in a manner that necessitates responsible use and application of AI. As suggested above, disclosures in patent claims may be problematic where they bring about knowledge transfer of malign uses of AI without an accompanying measure of control and or responsibility. Currently, the statutory provisions on inventions that may have such dual use or that may involve such problematic disclosures (or disclosures generally) are quite vague. For example, Nigeria's Patents and Designs Act[77] stipulates that patents cannot validly be obtained for inventions whose publication or exploitation would be contrary to public order or morality.[78] No definition is proffered for what kind of publication or exploitation would be contrary to public order but the Act indicates that the fact that the exploitation of a patent is prohibited by law does not necessarily translate to such invention being contrary to public order. In South Africa, the Patents Act[79] provides that 'a patent shall not be granted for an invention the publication of

71 See Okorie CI 'Long walk to copyright reform (Pt 2): South Africa's National Assembly rescinds its decision to pass the Copyright Amendment Bill'. Cf. Elkin-Koren N and Netanel NW 'Transplanting fair use across the globe: A case study testing the credibility of US opposition' at 1121.

72 (CCT 320/21) [2022] ZACC 33 (21 September 2022).

73 Act No. 98 of 1978 as amended.

74 *Blind SA v Minister of Trade, Industry and Competition and Others* (CCT 320/21) [2022] ZACC 33 (21 September 2022) para. 6.

75 Marivate at 15.

76 Zhang B and Wang H 'Network Proximity Evolution of Open Innovation Diffusion: A Case of Artificial Intelligence for Healthcare' at 10–11.

77 Act No. P2 of 2004 s 4.

78 S 13 makes a similar provision in the case of industrial designs.

79 Act No. 98 of 1978 as amended s 25(4).

which would be generally expected to encourage offensive or immoral behaviour'. Section 36(1)(b) goes on to empower the Registrar of Patents to refuse a patent application where it appears to the Registrar that 'the use of the invention to which the application relates would be generally expected to encourage offensive or immoral behaviour'. Under section 36(2), the registrar may also refuse a patent application where it appears to him that the invention in respect of which the patent application is made might be used in a manner contrary to law unless the applicant amends the specification to include relevant disclaimers as to the illegality. These statutory provisions lead to at least three possibilities, namely (1) the grant or non-grant of the patent can be used as a tool to control the publication of inventions that are deemed contrary to public order or morality or deemed offensive. This could apply to sensitive, weaponisable technologies including AI; (2) a patent may be granted for such inventions but its exploitation prohibited by law; and (3) the discretion of the Registrar (at least in the case of South Africa) may be a tool to refuse AI patent applications that may be problematic. These possibilities should form the basis as to how African countries should reform their respective patent systems to undertake substantive examinations in a manner that caters for innovations in AI and other emerging technologies, and how to design a publication and disclosure system that would adequately cater for innovations in AI to dissuade diversion for malign purposes. The possibilities should also inform the design of systems to encourage disclosure of inventions to government even where the prohibition of exploitation or refusal of patents is likely.

Where the patents system is problematic (and sometimes, despite the availability of patents protection), trade secrets and contractual protection confidential information are the go-to protection/ownership systems for innovations involving AI applications/tools. In such cases, and unlike the patent system, there is little or no access to technical knowledge in the public domain regarding such innovations. Also, the fact that trade secrets and technical know-how are currently protected through contracts can be problematic. Contracts are not necessarily secure protection means. Moreover, to the extent that there are no disclosures, sensitive technologies may be transferred to malevolent third parties without government's knowledge. To address this issue, it may be helpful to provide explicit statutory protection for trade secrets, which would indicate thresholds for disclosure of trade secrets to governments and require government action to guarantee confidentiality of information disclosed to it.

There is a growing movement within the IP and text and data mining (TDM) fields to recognise and enforce a right to research as a human right.[80] Such right to research in the case of African countries has both constitutional underpinnings and IPRs (especially, copyright) exceptions.[81] According to Oriakhogba,

> 'the right to research will lead to the enshrinement of a positive user right that will confer researchers (including authors), libraries and archives the capacity to protect and enforce a right of access to information covered by copyright . . . [i]t will also solve the copyright exclusivity challenge to text and data mining within the African context'.[82]

80 See Flynn S, Schirru L, Palmedo M and Izquierdo A 'Research Exceptions in Comparative Copyright'; Geiger C 'The Missing Goal-Scorers in the Artificial Intelligence Team: Of Big Data, the Fundamental Right to Research and the failed Text and Data Mining limitations in the CSDM Directive'.

81 Oriakhogba DO 'The Right to Research in Africa: Making African Copyright Whole' at 39.

82 Ibid. at 18.

While the enshrinement of a right to research that corelates with IPRs is a worthy step towards ensuring that IPRs do not get in the way of AI in Africa, the question of its implementation remains. As suggested elsewhere, access-promoting systems and or solutions must go beyond legislative solutions and judicial interpretation and focus on *how* (best) to ensure the practical application, implementation and or utilisation of such solutions.[83] To address this issue in relation to promoting the development and deployment of AI as tools, government-backed activities in the form of explainers, guidance notes, press releases etc.[84] and active citizen participation from AI developer communities may provide practical guidance as to design and customisation of the IP system.[85] That said, there are counter arguments to using copyright exceptions to promote access to data to build AI systems.

In 2023, the UK Government decided that it will not broaden the scope of its copyright limitations and exceptions to cover TDM to train the AI model. The prevailing reasoning behind such decision was the argument that copyright exceptions to cover TDM will adversely affect the rights holders and possibly destroy the creative industry.[86] However there was no empirical evidence to suggest that training AI models with TDM would be prejudicial to the creative industry and creators. Moreover, the focus on the debate was limited to copyright, without any or much consideration of patent law. The patent systems could benefit from AI as it reduces the time spent on reading long and complicated patent descriptions to foster innovation and competition. More significantly, the fact that the UK Government declined to proceed with TDM exceptions does not mean that the door is forever closed, nor does it necessarily follow that Africa should follow the same trajectory.

One aspect of the patent system that could benefit from reforms that would serve to promote AI in Africa is the timing and content of patent disclosures. As stated earlier, the patents system requires that potential patentees file their claim specifications at the time of applying for patents protection. No further disclosures are required beyond this point. Generally, patent disclosures happen before commercialisation. Even when it happens after commercialisation, there are usually several improvements and refinements to the invention before and during commercialisation. These improvements and refinements could come because of market testing, products or service distribution, customer feedback, technology transfers, feedback from interactions with government and regulatory authorities etc.[87] The knowledge from these improvements and refinements would of course not be part of the patent disclosures and therefore be unknown and secrets and could even be secured and protected as trade secrets. Yet, if one

83 See the discussion in Okorie CI 'Fair use or fair dealing in Africa: The South African experience' Ch. 17.

84 See UK IP Office: 'Examining patent applications relating to artificial intelligence (AI) inventions: The Guidance'; Okorie CI 'Wanjiru v Machakos University: Image rights and its relationship with constitutional/human rights in Kenya'.

85 Yu PK 'Customizing fair use transplants' advises in relation to the furore on adoption of fair use: '[P]olicymakers and commentators advocating copyright reform should avoid focusing too much on efforts to transplant fair use. Rather, they should put more time, effort, energy and resources into exploring ways to design or customize fair use'; Elkin-Koren N 'The New Frontiers of User Rights' at 11.

86 UK Parliament: 'Artificial Intelligence: Intellectual Property Rights'.

87 See *Biotech Laboratories (Pty) Ltd v Beecham Group PLC and Another* 2002 (4) SA 249 (SCA) involving package inserts improved based on feedback from the Medicines Control Council.

considers one of the key purposes or rationale for patent monopoly – the knowledge disclosed in the patent claims in exchange for a limited monopoly – this 'static' disclosure system is problematic. It is even more problematic for dual use inventions such as AI where other areas of AI application may go undetected. There are different suggestions in the literature as to how to address the problem posed by the 'static' disclosure system, in particular how to move instead to some sort of dynamic patent disclosures to be made post-filing and/or post grant.[88]

Fromer suggests that rather than require patentees to disclose all commercialisation information related to their patents post filing, US law should require a different form of dynamic patent disclosures – patentees should be required to divulge to the patent office all inventions that they or their licensees commercialises.[89] The benefits of this approach, according to Fromer, are that the public would have a better understanding of the scope of the patent claim and there would be an increase in the purchase of the disclosed products as well as a better understanding of the patent's contribution to knowledge.[90] Where AI tools or applications improve the commercialisation of a patented invention, a dynamic patent disclosure system can ensure that this information is available to the public. One other benefit of this approach to disclosures is that it provides government and policy makers with an empirical and more systemic understanding of the varied uses and applications of specific inventions and technologies which can in turn lead to understanding foreign interest in and acquisition of AI tools emanating from Africa. This chapter argues that some of these approaches to dynamic disclosures may well serve the opportunities and challenges that AI presents to Africa.

The dynamic patent-disclosure approach proposed by Fromer is somewhat similar to the government approval of technology transfer system applicable in Nigeria. Nigeria's National Office for Technology Acquisition and Promotion Act 2004 (NOTAP Act) requires Nigerian companies to seek and obtain the approval of NOTAP for acquisition and transfers of foreign technologies.[91] Per the recent guidelines published by NOTAP, applicants for approval involving commercialisation of the results of research and development are required to submit a feasibility report of their project with prototypes of their technologies while applicants for technology-transfer agreements must submit a draft of the technology agreements.[92] This regulatory approach enables the State to access some of the benefits of dynamic disclosures.[93] However, there are certain drawbacks to the current system.

The NOTAP Act is 'import-facing' as it focuses on transfer and acquisition of foreign technology into Nigeria and does not (directly) deal with the transfer of Nigeria-developed technology out of the country. Further, where the National Office for Technology Acquisition and Promotion (NOTAP) refuses to register an agreement, the relevant Nigerian company will be unable to access official banking channels through which they may pay their foreign investor for technology acquired. The decision of the

88 Fromer JC 'Dynamic patent disclosure' at 1721–1723; Chien C 'Rethinking Patent Disclosure' at 1849 and 1866–1872.
89 See Fromer 'Dynamic patent disclosure' at 1722.
90 Ibid. at 1723.
91 See s 5(2) of the Act.
92 See NOTAP: 'Revised guidelines for registration and monitoring of technology transfer agreements in Nigeria'.
93 Ajibo CC et al. 'Technology transfer for development in Nigeria: patterns, problems and prospects' at 70–91.

Nigerian Court of Appeal in *Stanbic IBTC Holdings Plc v Financial Reporting Council of Nigeria & NOTAP*,[94] confirms that the scope of NOTAP's powers does not extend to technology transfers for exporting technology out of Nigeria. The Court further held that even in the case of technology import, non-registration of contracts with NOTAP does not invalidate or void such contracts. The only effect of failure to register technology-transfer contracts is that payments for such technology through or on the authority of the CBN or any licensed Nigerian bank cannot be made. While this decision and its interpretation of the NOTAP Act provides some clarification as to NOTAP's statutory role, it has the effect of dissuading registration in the case of technology exchanges. Increasingly, technology transfers go both ways and are increasingly exchanges between parties as opposed to one party transferring to the another. Furthermore, payments and investments for technology are not always in cash. Payments and investments may be in kind and regulatory oversight must devise ways to secure innovation that follow such route.

However, there are other provisions in the NOTAP Act that may be deployed to help the cause of promoting AI development and application. By virtue of sections 1 and 2 of the NOTAP Act, other functions may be conferred on NOTAP pursuant to the Act and the governing body of NOTAP (known as the Governing Council of the National Office for Technology Acquisition and Promotion) has the powers and responsibility to formulate policy for the NOTAP. These provisions may be utilised to expand NOTAP's policies and functions to include technologies exported from Nigeria. Whether a registration system that applies to all technology exports should be implemented is a different matter entirely. A notification system may be best with a time limit for NOTAP to approve or disapprove and NOTAP equipped with appropriate training to identify red flags in terms of AI dual-use concerns and to conduct expedited reviews.

While there are financial costs associated with collecting, curating, and submitting the information required in a dynamic disclosure system, such costs may be offset with benefits or incentives for patentees and AI developers.[95] Furthermore, concerns around how to ensure compliance with the requirements by providing accurate and verifiable data may be ameliorated by providing for penalties or fines for false or misleading information.[96] Pursuant to section 14 of the NOTAP Act, NOTAP may require companies to furnish information as it (NOTAP) may specify and there are penalties for giving false information.

7.5 Conclusion

If the IP legal framework is to contribute to harnessing the opportunities and addressing the challenges of AI in Africa, it is crucial to appreciate that the context of the continent requires to instead enable AI development not necessarily with IPRs but by using the IP system to provide an enabling environment for data access, data curation and disclosures. As such, this chapter proposes that delineating and maintaining the scope of and approach to IP protection, as well as actualising limitations and exceptions, can help South Africa and other African countries to better utilise AI and meet its development goals and plans and address concerns to national security.

94 (2018) LCN/12169(CA).
95 Fromer 'Dynamic patent disclosure' at 1732.
96 Ibid. at 1734.

7.6 References

473 Resolution on the need to undertake a Study on human and peoples' rights and artificial intelligence (AI), robotics and other new and emerging technologies in Africa – ACHPR/Res 473 (EXT.OS/ XXXI) 2021.

Ajibo CC, Anozie MC, Onyeabor E, Umahi TO, Odinkonigbo JJ and Agu H 'Technology transfer for development in Nigeria: patterns, problems and prospects' (2019) *Commonwealth Law Bulletin* 45(1) 70–91.

Akter S, Katina M, Uddin Rajib M, McCarthy G and Rahman M 'Transforming Business using Digital Innovations: The Application of AI, Blockchain, Cloud and Data Analytics' (2020) *Annals of Operations Research* 308 7.

Andrews L, Paradise J, Holbrook T and Bochneak D 'When patents threaten science' (2006) *Science* 314 (5804) 1395–1396.

Aplin T (ed.) *Research Handbook on Intellectual Property and Digital Technologies* (Edward Elgar Publishing, 2022).

Aplin T and Pasqualetto G 'Artificial Intelligence and Copyright Protection' in Ballardini RM, Kuoppamäki P and Pitkänen O (eds) *Regulating Industrial Internet Through IPR, Data Protection and Competition Law* King's College London Law School Research Paper ch. 5.

Appadurai A 'The right to research' *Globalisation, societies and education* (2006) Vol. 4(2) 167–177.

Ballardini RM, Kuoppamäki P and Pitkänen O (eds) *Regulating Industrial Internet Through IPR, Data Protection and Competition Law* (Kluwer, 2019).

Ballardini RM He K and Roos T 'AI-generated content: authorship and inventorship in the age of artificial intelligence' *Online Distribution of Content in the EU* (2019).

Bedoya GM, Montoya RD, Tabilo-Munizaga G, Pérez-Won M, Lemus-Mondaca R, 'Promising Perspectives on Novel Protein Food Sources Combining Artificial Intelligence and 3D Food Printing for Food Industry' *Trends in Food Science & Technolog*y 128 (2022) 38.

Block D, Laxton DM, Zvikomborero B, Kamohi L, Ramashia F, Kanwa L, Mashatola SN, Bob TK, Moyo T, Semenya A and Van der Westhuizen B 'The Impact of Poor Policy Implementation by the Government of the republic of South Africa of Service Delivery' *Reginsights* (4 July 2020) <https://www.regenesys.net/reginsights/the-impact-of-poor-policy-implementation-by-the-government-of-the-republic-of-south-africa-on-service-delivery/>.

Bosher H and Rosati E (eds) *Developments and Directions in Intellectual Property Law. 20 Years of The IPKat* (OUP: in press).

Bregonje M 'Patents: A unique source for scientific technical information in chemistry related industry?' *World Patent Information* (2005) Vol. 27(4) 309–315.

Brodie ML and Mylopoulos J 'Knowledge Base Management Systems: Integrating Artificial Intelligence and Database Technologies' *Springer Science & Business Media*, 2012.

Business Insider: 'SA becomes the first country in the world to award a patent to an AI-generated invention' (3 August 2021) <https://www.businessinsider.co.za/south-africa-first-in-the-world-to-award-an-ai-patent-2021-8>.

Carolan M 'The Problems with Patents: A Less than Optimistic Reading of the Future' *Development and Change* (2009) Vol. 40:2 361.

Chidede T 'The Role of Intellectual Property Rights' Protection in Advancing Development in South Africa' *Law, Democracy and Development* 26 (2022) 168.

Chien C 'Rethinking Patent Disclosure' (2016) *Vand Law Review* 69 1849–1872.

Comer A 'AI: Artificial Inventor or the Real Deal?' (2021) *North Carolina Journal of Law & Technology* 22:3 447.

Comiter M 'Attacking Artificial Intelligence: AI's Security Vulnerability and What Policymakers Can Do About It' *Belfer Center for Science and International Affairs* (August 2019) 55.

Crouch D 'Legal fictions and the corporation as an inventive artificial intelligence' in Aplin T (ed.) *Research Handbook on Intellectual Property and Digital Technologies*.

De Lange J 'What are the reasons for unemployment in South Africa (2023)?' (15 March 2023) <https://briefly.co.za/facts-lifehacks/services/155202-what-reasons-unemployment-south-africa-2023/>.

Duque Lizarralde M and Contreras HA 'The real role of AI in patent law debates' (2022) *International Journal of Law and Information Technology* 30(1) 23–46.

Durojaye E and Mirugi-Mukundi G (eds) *Exploring the link between poverty and human rights in Africa* (Pretoria University Law Press, 2020).

Eckart de Castilho R, Margoni T, Dore G & Labropoulou P 'A Legal Perspective on Training Models for Natural Language Processing' *Researchgate* (May 2018) <https://www.researchgate.net/publication/325343460_A_Legal_Perspective_on_Training_Models_for_Natural_Language_Processing> and <https://aclanthology.org/L18-1202.pdf> (accessed 10 May 2023).

Elkin-Koren N 'Copyright in a digital ecosystem: a user-rights approach' in Okediji R (ed.) *Copyright Law in an Age of Limitations and Exceptions*.

Elkin-Koren N 'The New Frontiers of User Rights' (2016) 32 *American University International Law Review* 11.

Elkin-Koren N and Netanel NW 'Transplanting fair use across the globe: A case study testing the credibility of US opposition' (2020) *Hastings Law Journal* 72 1121.

Flynn S, Schirru L, Palmedo M and Izquierdo A 'Research Exceptions in Comparative Copyright' (2022) *PIJIP/TLS Research Paper Series* no. 75 <https://digitalcommons.wcl.american.edu/research/75>.

Fromer JC 'Patent disclosure' (2008) *Iowa Law Review* Vol. 94 548–551.

Fromer JC 'Dynamic patent disclosure' (2016) *Vand Law Review* Vol. 69 1721–1723.

Garon JM 'When AI Goes to War: Corporate Accountability for Virtual Mass Disinformation, Algorithmic Atrocities and Synthetic Propaganda' (2022) *North Kentucky Law Review* Vol. 49 No. 2 181.

Geiger C 'The Missing Goal-Scorers in the Artificial Intelligence Team: Of Big Data, the Fundamental Right to Research and the failed Text and Data Mining limitations in the CSDM Directive' (2021) *PIJIP/TLS Research Paper Series* no. 66 <https://digitalcommons.wcl.american.edu/research/66>.

George A and Walsh T 'Artificial intelligence is breaking patent law' (2022) *Nature* 605(7911) 616–618.

Gervais D 'The Human Cause' in Aplin T (ed.) *Research Handbook on Intellectual Property and Digital Technologies*.

Jarrahi MH 'In the Age of the Smart Artificial Intelligence: AI's Dual Capacities for Automating and Informating Work' *Business Information Review* 36:4 (2019) 178.

Javaid M, Haleem A, Singh PR, Suman R, Gonzalez SE 'Understanding the adoption of Industry 4.0 technologies in improving environmental sustainability' *Sustainable Operations and Computers* 3 (2022) 203.

Jegede O and Ncube C 'Science, Technology, Innovation Management for Industrial Development in South Africa: Implications for The Fourth Industrial Revolution' (2021) *Science* 15(9) 680.

Kavanagh C 'New Tech, New Threats, and New Governance Challenges: an Opportunity to Craft Smarter Responses?' *Carnegie Endowment for International Peace* (2019) 25.

Kleyn M and Harmelen JV 'Trade Secrets – South Africa' 2 *les Nouvelles – Journal of the Licensing Executives Society* (2021) Vol. 2 137.

Labour market dynamics survey, 2018 (Government Printer, Statistics South Africa, 2021).

Lai A 'Artificial Intelligence, LLC: Corporate Personhood as Tort Reform' (2021) *Michigan State Law Review* 597.

Lee D & Yoon SN 'Application of Artificial Intelligence-Based Technologies in the Healthcare Industry: Opportunities and Challenges' *International Journal of Environmental Research & Public Health* (2021) 271 4–5.

Levendowski A 'How copyright law can fix artificial intelligence's implicit bias problem' (2018) *Washington Law Review* 93.

Mackenzie M, Keating P and Cambrosio A 'Patents and free scientific information in biotechnology: Making monoclonal antibodies proprietary' *Science, Technology & Human Values* (1990) Vol. 15(1) 65–83.

Makulilo AB 'The context of data privacy in Africa' (2016) *African data privacy laws* 3–23.

Manzi J and Scott S (2019) 'AI for Life Sciences: What is it Good For?' <https://foundry.ai/wp-content/uploads/2019/10/Foundry.ai-White-Paper-Life-Sciences-Digital.pdf>.

Marivate V 'Why African natural language processing now? A view from South Africa' AfricaNLP (2020) 9.

May J 'Integrating Human Rights Approach to Food Security in National Plan and Budget: The South African National Development Plan' in Durojaye E and Mirugi-Mukundi G (eds) *Exploring the link between poverty and human rights in Africa*.

Mgbeoji I 'African patent offices not fit for purpose' (2014) *Innovation & Intellectual Property: Collaborative Dynamics in Africa* 234–247.

Mncayi P and Meyer FD 'Evaluating the Determinants of the Perceptions of Underemployment among Young University Graduates: A South African University case' (2022) *Cogent Social Sciences*.

Mohamed S 'Raising our voice in artificial intelligence' Sautiyetu (4 August 2019) Deep Learning Indaba Blog <https://deeplearningindaba.com/blog/2019/08/sautiyetu-raising-our-voice-in-artificial-intelligence> (accessed 27 June 2020).

Moran RC, Burton J & Christou G 'The US Intelligence Community, Global Security, and AI: From Secret Intelligence to Smart Spying' *Journal of Global Security Studies* 8:2 (2022) 11.

'National Development Plan 2030: Our future – make it work' (South Africa) (NDP 230) <https://www.gov.za/ sites/default/files/gcis_document/201409/ndp-2030-our-future-make-it-workr.pdf>.

National Planning Commission: Diagnostic Report 2011 <https://www.gov.za/sites/default/files/gcis_document/201409/npcdiagnosticoverview1.pdf>.

Ncube C and Rutenberg I 'Intellectual property and Fourth Industrial Revolution technologies 1' *Leap 4.0. African Perspectives on the Fourth Industrial Revolution: African Perspectives on the Fourth Industrial Revolution* (MISTRA, 2021).

Noort GV, Himelboim It, Martin J and Collinger T 'Introducing a Model of Automated Brand-Generated Content in an Era of Computational Advertising' (2020) *Journal of Advertising* 49:4 411.

NOTAP: 'Revised guidelines for registration and monitoring of technology transfer agreements in Nigeria' (February 2020) <https://notap.gov.ng/new_dev/wp-content/uploads/2022/03/notap_tech_trans_agreement_revised_guidelines.pdf>.

Okediji R (ed.) *Copyright Law in an Age of Limitations and Exceptions* (Cambridge University Press, 2017).

Okitasari M and Katramiz T 'The national development plans after the SDGs: Steering implications of the global goals towards national development planning' (2022) *Earth System Governance* 12 1-11.

Okorie CI 'Artificial Intelligence Systems as Inventor in South African patent system: The case of DABUS' (2021) <https://ipkitten.blogspot.com/2021/08/artificial-intelligence-system-as.html>.

Okorie CI 'Fair use or fair dealing in Africa: The South African experience' in Bosher H and Rosati E (eds) *Developments and Directions in Intellectual Property Law. 20 Years of The IPKat* Chapter 17.

Okorie CI 'Long walk to copyright reform (Pt 2): South Africa's National Assembly rescinds its decision to pass the Copyright Amendment Bill' (2021) <https://ipkitten.blogspot.com/2021 /05/long-walk-to-copyright-reform-pt-2.html>.

Okorie CI 'Technology and national security: what's IP got to with it?' (2022) *Journal of Intellectual Property Law and Practice* 17(8) 601–602.

Okorie CI 'Wanjiru v Machakos University: Image rights and its relationship with constitutional/human rights in Kenya' (2022) <https://ipkitten.blogspot.com/2022/09/wanjiru-v-machakos-university-image.html?m=1>.

Oriakhogba DO 'DABUS gains territory in South Africa and Australia: Revisiting the AI-inventorship question' (2021) *South African Intellectual Property Law Journal* Vol. 9(1) 87–108.

Oriakhogba DO 'What If DABUS Came to Africa? Visiting AI Inventorship and Ownership of Patent from the Nigerian Perspective' (2021) *Business Law Review* Vol. 42(2) 89–99.

Oriakhogba DO 'The Right to Research in Africa: Making African Copyright Whole' (2022) *Joint PIJIP/TLS Research Paper Series* 39.

Ouellette LL 'Do patents disclose useful information' *Harvard Journal for Law & Technology* (2011) Vol. 25 545.

Ouellette LL 'Who reads patents?' *Nature Biotechnology* (2017) Vol. 35(5) 421–424.

Pappas IO, Mikalef P, Giannakos MN, Krogstie J and Lekakos G 'Big Data and Business Analytics Ecosystems: Paving the way towards Digital Transformation and Sustainable Societies' (2018) 16 *Information Systems and e-Business Management* 479.

Pereira CG, Da Silva RR and Porto GS 'The scientific information provided through patents and its limited use in scientific research at universities' *Brazilian Journal of Science and Technology* (2015) Vol. 2 111.

Pillay N *Artificial intelligence for Africa: An opportunity for growth, development, and democratization* (University of Pretoria, 2020).

Polyakova A 'Weapons of the weak: Russia and AI-driven asymmetric warfare' *Brookings* (15 November 2018) <https://www.brookings.edu/articles/weapons-of-the-weak-russia-and-ai-driven-asymmetric-warfare/>.

Power Patent: 'USPTO Deploys Numerous AI Tools to Aid Patent and Trademark Examination' (13 February 2023) <https://powerpatent.com/blog/uspto-deploys-numerous-ai-tools-to-aid-patent-and-trademark-examination#:~:text=Patent%20 Examination%3A%20AI-powered%20systems%20can%20assist%20examiners% 20in,process%20and%20improve %20the%20accuracy%20of%20patent%20grants>.

Rodriguez-Esteban R and Bundschus M 'Text mining patents for biomedical knowledge' *Drug Discovery Today* (2016) Vol. 21(6) 997–1002.

Rosati E 'Copyright as an obstacle or an enabler? A European perspective on text and data mining and its role in the development of AI creativity' *Asia Pacific Law Review* (2019) Vol. 27(2) 198–217.

Samuelson P 'Justifications for Copyright Limitations & Exceptions' in Okediji R (ed.) *Copyright Law in an Age of Limitations and Exceptions*.

Scannell B 'When Irish AIs are smiling: could Ireland's legislative approach be a model for resolving AI authorship for EU member states?' (2022) *Journal of Intellectual Property Law and Practice* 17(9) 727–740.

Seymore SB 'The teaching function of patents' (2009) *Notre Dame Law Review Vol.* 85 621.

Springer C, Bayen, M and Giuliani D 'Africa: A Look at the 442 Active Tech Hubs of the Continent' <https://www.gsma.com/mobilefordevelopment/blog-2/africa-a-look-at-the-442-active-tech-hubs-of-the-continent/>.

Sutherland E 'The fourth industrial revolution – the case of South Africa' (2020) *Politikon* 47(2) 234.

Tewari DD 'Is matric math a good predictor of a student's performance in the first year of a university degree? A case study of faculty of management studies, University of KwaZulu-Natal, South Africa' (2014) *International Journal of Educational Sciences* 6(2) 233–237.

Thaldar D and Naidoo M 'AI inventorship: The right decision?' (2021) *South African Journal of Science* 117(11–12) 1–3.

Toyama K 'The internet and inequality' Communications of the ACM (2016) 28–30 doi:10.1145/2892557.

UK IP Office: 'Examining patent applications relating to artificial intelligence (AI) inventions: The Guidance' (22 September 2022) <https://www.gov.uk/government/publications/examining-patent-applications-relating-to-artificial-intelligence-ai-inventions/examining-patent-applications-relating-to-artificial-intelligence-ai-inventions-the-guidance>.

UK Parliament: 'Artificial Intelligence: Intellectual Property Rights' (1 February 2023) <https://hansard.parliament.uk/commons/2023-02-01/debates/7CD1D4F9-7805-4CF0-9698-E28ECEFB7177/ArtificialIntelligenceIntellectualPropertyRights> (accessed 6 July 2023).

Vaishya R, Javaid M, Khan HI and Haleem A 'Artificial Intelligence (AI) applications for COVID-19 pandemic' *Diabetes & Metabolic Syndrome: Clinical Research & Reviews* (2020) Vol. 14 337.

Van der Berg S & Gustafsson M 'Educational Outcomes in Post-apartheid South Africa: Signs of Progress Despite Great Inequality' in Spaull N & Jansen JD (eds) *South African Schooling: The Enigma of Inequality: A Study of the Present Situation and Future Possibilities.*

Spaull N & Jansen JD (eds) *South African Schooling: The Enigma of Inequality: A Study of the Present Situation and Future Possibilities* (Springer: Statistics South Africa e-book, 2020).

Varianos D and Stavrou G 'Surveillance Infrastructure and Artificial Intelligence: Challenging Democracy and Human Right in China' *The Cyprus Journal of Sciences* 20 (2022) 27.

Brundage M, Avin S, Clark J, Toner H, Eckersley P, Garfinkel B, Dafoe A, Scharre P, Zeitzoff T, Filar B, Anderson H, Roff H, Allen GC, Steinhardt J, Flynn C, hÉigeartaigh ÓS, Beard S, Belfield H, Farquhar S, Lyle C, Crootof R, Evans O, Page M, Bryson JJ, Yampolskiy VR and Amodei D 'The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation' *ArXiv* (2018) 18–20.

Walter R 'Colonialism as a System for Under Developing Africa' (15 June 2023) <https://www.versobooks.com/en-gb/blogs/news/4810-colonialism-as-a-system-for-underdeveloping-africa>.

Wilkens U 'Artificial intelligence in the workplace – A double-edged sword' *The International Journal of Information and Learning Technology* 37:5 (2020) 253.

'WIPO Begins Public Consultation Process on Artificial Intelligence and Intellectual Property Policy' PR/2019/843 (13 December 2019) <https://www.wipo.int/pressroom/en/articles/2019/article_0017.html>.

'Public Views on Artificial Intelligence and Intellectual Property Policy' (October 2020) <https://www.uspto.gov/sites/default/files/documents/USPTO_AI-Report_2020-10-07.pdf>.

Yang J, Chesbrough H & Hurmelinna-Laukkanen P 'How to Appropriate Value from General Purpose Technology by Applying Open Innovation' *California Management Review* (2022) Vol. 64:4 24.

'Youth still find it difficult to secure jobs in South Africa' <http://www.statssa.gov.za/?p=14415> (accessed 13 June 2023).

Yu PK 'Customizing fair use transplants' (2018) *Laws* Vol. 7(1) 9.

Zhang B and Wang H 'Network Proximity Evolution of Open Innovation Diffusion: A Case of Artificial Intelligence for Healthcare' (2021) *Journal of Open Innovation: Technology, Market, and Complexity* 7: 222 10.

Chapter 8

The challenges and potential of artificial intelligence interventions in weak public-health systems in Africa

8.1 Introduction

Healthcare provision in Africa is plagued by several factors at various levels. Public health facilities that most often provide the most accessible care to many on the continent are largely weak and fractured.[1] These public health systems are often limited by their institutional, systemic challenges as well as material limitations as a result of meagre funds.[2] Under these circumstances, these public health systems are unable to effectively provide population-wide basic healthcare, much less provide cutting-edge medical interventions supported by modern technological developments. In the face of these systemic and institutional challenges to affordable, accessible, and quality care on the continent, various recommendations that address different problem areas of health-care delivery have been proffered. Of these, an emerging area of exploration has been the possible use of artificial intelligence (AI) in healthcare delivery and how such a technological innovation may be harnessed to provide better healthcare. AI broadly refers to machine learning (ML) based on human defined objectives and data sets to make predictions, recommendations, and decisions, with varying levels of autonomy, without the requirement of human input or instruction.[3]

The advancement of AI as a helpful innovation in health has come with significant investment. In this meeting of the profit incentive[4] with the desire to provide healthcare solutions, there is an acknowledgment that AI can serve as a useful tool for fast tracking sustainable human development. This chapter examines the increased use of AI in healthcare, its application thus far as well as the challenges faced in its uptake in Africa. It argues that, while the prospect of AI uptake on the continent may be daunting and, in some cases, lead to apprehension around possible abuses and the encroachment of human autonomy, with the right regulatory and infrastructural frameworks in place, AI has the potential to significantly improve healthcare delivery in Africa. To do this, it is argued that AI cannot simply be treated as the new 'magic bullet' that fixes every systemic issue. It must rather be seen as a useful tool that can help spur necessary fundamental reform of health systems, as well as itself be a tool in said reform. This chapter thus argues that, in the African context, an increased focus must be placed on the use of AI for health systems strengthening, and not just for

1 Azevedo MJ 'The state of health system(s) in Africa: challenges and opportunities' at 5.
2 Oleribe OO et al. 'Identifying key challenges facing healthcare systems in Africa and potential solutions' at 395.
3 OECD: 'Recommendation of the Council on Artificial Intelligence'.
4 Owoyemi A et al. 'Artificial intelligence for healthcare in Africa' at 6.

interpersonal bio-medical interventions, which are by themselves also a good use of AI. The use of AI as a systemic intervention has the potential to address the foundational infrastructure required to sustain AI interventions as well as leverage on those reforms for wider uptake that is systemic in spread and not limited to a few health facilities. However, to be an effective health systems intervention, there needs to be health system leadership buy in, as well as the formulation of regulatory frameworks and a clear roadmap for upscaling the use of AI interventions. These interventions must be reflected in legislation and policy frameworks. Ultimately, it is argued here that a system-based approach to the incorporation of AI can help address the lingering fears around AI while justifying their integration by the scale of their impact. In this sense, AI can be both an instrument of health system reform as well as a by-product of said reform. To make this case, the chapter provides a brief background of the nature and scope of AI use in healthcare over time, and then engages with some of lingering fears around AI as a tool, especially in the context of healthcare delivery. It then engages with some of the more tangible systemic impediments to its uptake in the African healthcare setting. The chapter then discusses possible interventions for addressing this systemic challenges and highlights some of the current gaps in health systems capabilities that AI may help resolve for better healthcare delivery at a systemic level, while addressing the philosophical apprehensions around increased scaling up of its use.

8.2 The varied and incremental use of artificial intelligence in Africa

AI as a diagnostic tool began in the 1970s, where it was used to recommend treatments for glaucoma and infectious diseases.[5] Over the years, its use has expanded to a wide range of cutting-edge bio-medical research. However, much of this progress has been in the Global North, where its use is more predominant. There has however been an uptake of AI use in Africa in recent times.

First piloted in Kenya in the 1980s to improve health worker and health user interactions, and improve the detection of eye disorders, AI gained further traction in Egypt and Gambia, where it was used to assist rural health workers in making accurate diagnosis.[6] More recently in Kenya, a free chatbot that relies on AI to process and reply to questions on sexual and reproductive health has been deployed on several messaging apps.[7] In South Africa, AI has been deployed in the use of human resources planning for the public health service, by predicting how long health workers are likely to stay in the service.[8] In Nigeria, the possibility of using AI to diagnose birth asphyxia is being explored, especially in low-income settings with limited resources.[9] In Zambia, it is being used to diagnose diabetic retinopathy with significant success.[10] Tanzania and Zambia have seen the use of software to aid the diagnosis of pulmonary tuberculosis.[11]

In all the various instances AI is being used across the continent, while it has had varying levels of success, it is important to note that its uptake has been limited and

5 Ibid.
6 Ibid.
7 Ibid.
8 Ibid.
9 Ibid.
10 Ibid.
11 Ibid.

often confined to very specific health facilities or communities and not yet scaled up. The use and integration of AI, especially in the African context, has largely been led by entrepreneurs and innovators looking to disrupt and providing, cheaper, faster and more efficient solutions that address gaps in healthcare delivery in their target populations, and in some instances are a product of private lead solution seeking in the face of seemingly persistent intractable health systems failure. However, this new frontier in the use of ML to solve healthcare problems, has in turn led to fears around the nature of AI and its place in healthcare provision, both in principle and in practice and are now discussed.

8.3 Human-led versus machine-led healthcare provision

Perhaps the most pressing fear around the uptake of AI in healthcare is the possibility of its variance with the quest for a more patient-centric, empathy-driven and human right based model of healthcare. The increased automation of processes has the potential to undermine the nuance of the human interface that is deeply engrained in the legitimate expectations of health users. A reduction of health interactions to algorithms driven by efficiency and certainty, may appear to minimise the importance of the patient's desire for a listening ear, a helping hand and compassion, even where a purely biomedical intervention is not possible or its chances of success are slim.

One of the questions that frame the hesitance around the increased use of AI in healthcare in a context where the priority (assumed or real) is the respect and protection of human dignity, is: How much of our health processes and interventions can ethically be left to AI bereft of emotion? Health responsiveness research would argue that much of the health user experience is about how patients are made to feel seen and heard, as much as it is about favourable biomedical outcomes.[12] As such, the use of automation is probably best served by using it to free up more time for human interactions that truly matter and are central to the desire for reassurance and confidence that drive health users to seek out the expertise of health workers.

Another area of concern is the potential of increased recourse to algorithms for decision making, which may also be seen as increasing the chances of 'cold' decision making, especially where resources are scarce and limited. The use of AI for decision making in this context is defended by its proponents as a good thing, arguing that it simplifies decision making and makes it as objective as possible.[13] However, while the administrator who uses AI for such decision making may feel vindicated in the eventual decision, there is no certainty that the health user on the receiving end of the decision, especially when not in their favour, will be comforted in the knowledge that their fate was determined by an algorithm. Existing studies on patients' perception of good healthcare provision and responsiveness point to a desire to feel 'seen' and to have their concerns treated seriously, while being shown empathy, attention, and care.[14] This desire for sensitivity in care is supported by research that specifically examined

12 Mirzoev T and S Kane 'What is health systems responsiveness? Review of existing knowledge and proposed conceptual framework'.

13 Dyrbye LN et al. 'Burnout among health care professionals: a call to explore and address this underrecognized threat to safe, high-quality care'.

14 Reader TW, Gillespie A and Roberts J 'Patient complaints in healthcare systems: a systematic review and coding taxonomy' at 678–689.

the levels of patient acceptance of AI in healthcare and health outcomes decision making. In that study, 31% of respondents stated that they would be uncomfortable with receiving a diagnosis from an AI algorithm, while 40.5% stated that they would be somewhat uncomfortable.[15] The study also showed that with increased stakes like the nature of the health procedure or the nature of the disease being diagnosed, patients were more weary of AI use as well as possible unintended consequences.[16]

Another area of concern is the nature of data that makes up the code of AI in healthcare. Layered onto this concern is that of the possibility of AI running afoul of its code; no matter how well structured it happens to be. Addressing these concerns are an important step for securing larger stakeholder buy-in. If the ultimate dream of AI is to operate with considerable autonomy, with minimal human input, what measures are in place to ensure that such a system has fidelity to its initial imperative? What processes can and should we automate and what others are best left to the human interface? What trade-offs are we willing to make for speed and 'accuracy' which are primary motivators for the use of AI? Answers to these questions are increasingly being engaged with by innovators at the forefront of the development of AI and its capabilities. It is, however, pertinent that these questions continue to act as guardrails and sign posts for the type of AI that ought to be created and the failsafe that need to be put in place. However, ultimately, the work of ensuring compliance and fidelity to the goals of using AI to serve humanity will have to be done by eagle-eyed regulators who understand both the technology and the various competing interests at play.

8.4 The need to protect the 'public' in public health

Public authorities must be clear and bold in their oversight.[17] This in turn means that the regulators of the different aspects of AI technology formulation and eventual use and application, in health system leadership, intellectual property, and technology must work in cohesion, armed with the requisite knowledge of the technology whose implementation they are to oversee. Such a knowledge base will be necessary for the development of technical standards and a robust enough set of legal regulations that adequately protect patients' health rights. There is a duty to respect the rights of the health users and to protect them from interventions that can hinder their rights.[18] As part of these efforts, the granting of licences ought to be mandatory for any interventions to be used for humans and their health. A regulatory framework that also includes licensing can help filter out malevolent and negligent bad-faith actors while also limiting the pool available to assist health providers and health users' access and utilise trustworthy AI products and services only.[19]

Where the nature of the AI to be used is high risk, there must be an obligation on the developers to deposit with the regulator all necessary documentation on the use, design, and safety of the technology as well as any important instructions for use

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15 Khullar D et al. 'Perspectives of patients about artificial intelligence in health care'.

16 Ibid.

17 McKee M and Wouters OJ 'The Challenges of Regulating Artificial Intelligence in Healthcare: Comment on Clinical Decision Support and New Regulatory Frameworks for Medical Devices: Are We Ready for It? – A Viewpoint Paper'.

18 Trocin C et al. 'Responsible AI for digital health: a synthesis and a research agenda' at 1–19.

19 Donnelly D 'First Do No Harm: Legal Principles Regulating the Future of Artificial Intelligence in Health Care in South Africa' at 1–43.

where necessary.[20] This may include things like the source code, data source and the development tools used by the system.[21] To mitigate fears of intellectual property infringement, the regulator must also have clear directives in place to ensure that it does not breach its role nor the confidentiality of the developers' IP. With the necessary guarantees of protection of IP and trade secrets for the developer, authorities who have access to the data and the software of the AI technology, can verify both the claimed intended purpose, as well as its actual use and effects on individual patients, but more broadly on larger demographics.[22] As part of the roles of the regulator, there must also be a clear willingness to promote access to free, open and anonymised curated datasets to assist in ML and to train the systems to be used in providing healthcare to the populations for which they act as regulators.[23] These efforts must be followed by encouraging developers to use open government data in order to improve the data quality, as well as promote locally relevant datasets for AI. These steps however presume the existence of such carefully gathered data by agents of the state and more particularly the public health system and speak to the need to begin to gather said data where not currently available. Here, the need to ensure accurate and up-to-date data can be an important catalyst for important health system reform that addresses the paucity of relevant datasets and records. This also means that there must be the political will to ensure that AI utilises the right and full set of information, as opposed to possibly building on wrong information that replicates existing inequities and or spatial and geographical disparities. This concern speaks to the challenges around limited systemic infrastructure to support the maximal utilisation of AI. These challenges include the availability and reliability of data to train AI, lacunas in legislation shaping how data for AI is to be gathered and eventually used, as well as insufficient infrastructure to support AI use at scale, which are discussed below.

8.5 Challenges to the effective use of artificial intelligence in healthcare in Africa

8.5.1 *Availability of data and quality of data*

AI and ML depends on reliable and sufficient datasets to properly learn and adapt. The precision of the data available will determine how accurately it carries out the tasks assigned to it.[24] However, there is unfortunately the challenge of the absence of large clinical datasets, required for adequately training the AI models in Africa. The paucity of data is worsened by the limited level of digitisation of medical files and patient records, especially in public health systems across the continent.[25] This has meant that there is a significant gap in locally generated data that is useful for AI systems.

Another important issue that further complicates the challenge of data gathering and its use is that of ownership of data and the concerns around privacy and confidentiality. In this digital age, data is power. Therefore, who has access to data is as important

20 Ibid.
21 Ibid.
22 Ibid.
23 Brandusescu A, Freuler JO and Thakur D 'Artificial Intelligence: Starting the policy dialogue in Africa'.
24 Donnelly at 11–12.
25 Owoyemi.

as what that data is used for. Data in the hands of those who do not owe accountability to anyone but their shareholders, is a slippery slope. The legitimate concerns around privacy become even more important in the context of health delivery, especially when considering how intrinsic it is to the protection of patients' rights. Without proper regulations in place to guarantee the obscuring of patient data to remove identifiable markers, the issue of ownership and control of the requisite amount of patient data required for optimal ML is worsened. On the flipside, concerns around data gathering raise important questions on the part of the state and its failures to hitherto have reliable open access government data, while promoting the development of best practices. Here, the inability of the state to address foundational issues in health systems data management can lead to either the circumvention of the state by private parties, resulting in weaker state oversight and a further prioritisation of the profit incentive over health access, or the replication of inaccurate or incomplete information, tainted by bias, leading to unjust health outcomes.

8.5.2 *The replication of bias and injustice*

A closely linked issue that arises from the paucity of relevant data is that of the risk of the replication of flawed underlying notions and prejudices. In April 2019, the AI Now Institute published a study on gender, race, and power in AI, calling out the lack of diversity and the risk of bias, through the replication of 'historical patterns of discrimination'[26] in technologies. Without proper data that is context specific, algorithmic bias cannot properly account for any unique country settings in Africa. This incongruence has far-reaching effects, where AI developed elsewhere with datasets that are different and not representative of the physiologies are then used on African populations. The result of such superimposition of disparate data sets is varying degrees of success and accuracy, depending on the nature of diagnosis the AI is tasked with. For example, without a dataset that accurately depicts symptoms of heart attacks in women and how they present differently than men, there is likely to be a replication of the dismissal of women and their health concerns.[27] Similarly, without datasets that accurately depict the differences in genetic disorders and predispositions, diseases like diabetes and high blood pressure, which significantly affect Black people more, will be improperly diagnosed and managed by AI systems.[28] Beyond racial contexts, in the developmental context there can also be a replication of bias without a proper examination of the local context. For example, while a European disease-prevention programme may not prioritise water-borne disease, it is still a major concern in many African countries[29] and must be reflected in the kind of AI to be used for those populations. Furthermore, an undue presumption of infrastructural capacity by the AI system, if used in a rural area that is yet to possess such capacity may prove detrimental to that community, with unintended effects.[30] The determination of the type of AI to be used and the purpose for which it is to be used, must therefore be with the mind for contextual and situational awareness of limitations, as well as with the goal of helping to address those limitations.

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26 West SM, Whittaker M and Crawford K 'Discriminating systems'.

27 Sallstrom L, Morris OLIVE and Mehta H 'Artificial intelligence in Africa's healthcare: ethical considerations'.

28 Ibid.

29 Ibid.

30 Ibid.

8.5.3 *Paucity of legal regulations*

The uptake of AI and the possible abuses that can jeopardise the rights of those for whom it is intended is an important reason for regulatory intervention to ensure the ethical use of AI in healthcare. However, currently, specific laws to address and regulate AI are still in their infancy.[31] There is a need for a regulatory framework that is adaptable, to be relevant to the ever growing field of technology it seeks to address. One area that requires regulatory oversight is the collection and use of data. Robust protections must be in place to protect personal data and to prevent such data from being used against persons whose data has been collected. Also, the data can be sold and profited from without the knowledge or consent of the owners of the data. As such, it is imperative that strong data-protection laws are in place as well as clear guidelines on what and how AI may be used in healthcare, to protect individual privacy. The laws must empower people to be more active participants in AI-based decision making as well as the economic activities that rely on their data.[32] An example of such legal regulatory clarity may be found in South Africa's Protection of Personal Information Act,[33] which addresses questions around data privacy, personal information, and how they can be used. However, while it is an important piece of legislation that addresses the protection of data and personal information, its scope does not include AI regulation more broadly and there is still need for broader AI legislation beyond the issue of data management.

A core set of general principles on the ethical development and use of AI have also emerged, which still need to be reflected and operationalised in legal regulation, especially for an aspect of use as sensitive as healthcare. Unfortunately, however, despite the need for robust regulatory frameworks, the limited penetration of AI and ML into mainstream systems of operation, especially in the context of health, has meant that innovation has had to find its own way with little regulatory guidance. While many countries around the world are now developing policies and legal frameworks for the proper implementation of AI across various sectors, even those interventions have struggled to keep up with the innovation. In Africa, 42 of the 55 countries have national health policies that address digital health policy or strategy.[34] However, these policies are inadequate for addressing the ever-evolving challenges that the adoption of AI in healthcare raise.

8.5.4 *Inadequate infrastructure*

There is the ever-present hope that AI can help compensate for institutional and systemic failures in public health systems and will be used to 'leapfrog' into better healthcare. The implication of this hope is that more aspects of healthcare can increasingly be left up to AI innovations to solve. Such an approach would be problematic on two fronts. For one, they would fail to provide the fundamental tools necessary to meet the health needs of the population, thus running the risk of inadvertently replicating existing inequities. Secondly, without the necessary infrastructure in place, even the possible reach and uptake of AI interventions will be limited. It is for these reasons that

31 Donnelly.
32 Brandusescu, Freuler and Thakur.
33 Protection of Personal Information Act No. 4 of 2013 (POPIA).
34 Vota W 'Every African Country's National eHealth Strategy or Digital Health Policy'.

AI ought to be used not as a tool for 'skipping' over systemic and infrastructural challenges, but rather to fast track the fixing of those issues. Doing this would enable AI to be both more effective in the long run as well as more of use.

Beyond the limitations of weak health systems unable to sustain widespread AI uptake, AI innovations to address public healthcare concerns and provide far reaching healthcare in Africa are further limited by a wider lack of infrastructure to support digitisation at scale. Perennial issues around steady power supply and internet penetration[35] are likely to limit AI interventions to the same demographics that currently have access to and can afford private healthcare in circumscription of failing public health systems. With about 50 % of Africans[36] and less than 30 % of health facilities on the continent having access to reliable electricity,[37] the ability to execute and sustain digital approaches to the health challenges, marginalised communities face is further significantly limited.

8.5.5 *Costs of artificial intelligence application and adoption*

The cost of assembling an AI-based solution to healthcare varies depending on the nature of the problem being addressed as well as the simplicity of the mode adopted to address the problem. However, the cost of setting up and improving later on can prevent it from being done, especially if the developer must acquire critical parts necessary for the proper functioning of the ML system due to insufficient infrastructures. This is especially where the developer is a local start-up who may be familiar with the contextual challenges but lack adequate funding for data acquisition and preparation costs, hardware and computing tools, and the ability to expeditiously maintain the system and upgrade it when necessary.

The acquisition of data involves the proper collection, cleaning up and annotation of data which forms the basis of the AI's ability to learn and adapt. The quality of an AI application is largely dependent on the quality of data upon which it is built. The ability to gather and utilise the necessary data is critical to the eventual success of the AI-based intervention. As such, this stage is often time consuming, due to its central nature to everything else. The kind of data to be used can also be quite costly, depending on the granularity of the information that is required as well as the source of the data. Even if and where a dataset is available for free, it may only be so if it is used for research purposes. Free use may not be possible at scale, especially if the datasets needed to address the healthcare problems are geography and context specific as will usually be in the case for an intervention in the African context.[38]

Even though AI is not new technology in many ways, its more recent upscaling is because of more recent innovations that allow for greater computational power and massive data management and interpretation. This sort of computational power comes at a premium, along with other accessories necessary to process the high volumes of calculations needed to train and run the artificial neural networks.[39] Unfortunately, the kind of computing power that is necessary for such tasks is steep especially when

35 Owoyemi.

36 Ibid.

37 Adair-Rohani H et al. 'Limited electricity access in health facilities of sub-Saharan Africa: a systematic review of data on electricity access, sources, and reliability' at 249–261.

38 Owoyemi.

39 Ibid.

bearing in mind the fact that such equipment will be imported as they are not locally manufactured because of the varying rates of currency exchange that make importation costly. In many instances also, to mitigate the perennial challenges of power outage and the potential destruction of electronic equipment, other equipment that protect and provide a stop gap are required; all in economies where even basic computing tools can be a luxury. To circumvent some of these challenges related to the acquisition of needed technology, cloud computing services may be used, which also have their own attendant costs regarding the services[40] as well as the cost of internet access required, which is still largely expensive across the continent.

The cost involved in ensuring that an AI application keeps working as intended can also vary depending on the extent of change to the existing system that is required. Often, the application will need significant changes to keep up with user expectations, which itself is due to the ever-evolving nature of technology and what users conceive as possible. Due to the ever-growing nature of the technology, new tools are constantly being invented and introduced, while old tools either get obsolete or upgraded. All these factors put together often mean that while ML and AI interventions may be useful for building complex systems and adapting to the needs of already existing complex systems, the convenience they bring come with high downstream costs, which in turn can make them prohibitive, especially in the African context.[41]

The various challenges discussed above not only present roadblocks to the implementation and uptake of AI as a veritable intervention in healthcare at scale, but they call for adaptive solutions that can lead to the maximisation of the potential of the technology without unduly creating new problems or exacerbating the existing ones. While these challenges are numerous, overcoming them can be a worthwhile pursuit, if done with the understanding that they will help lead to systemic resolutions of otherwise persistent and seemingly intractable problems in health systems and attempts to strengthen them for better service delivery.

8.6 Artificial intelligence use for health systems strengthening

The USAID identifies the potential of AI in health systems strengthening and management.[42] Here, interventions can best be optimised by focusing on integrated electronic medical record management and storage, analysis of medical cases and assistance of medical personnel in clinical decision-making, quality assurance, fraud detection and prevention, health worker training, human resources optimisation.[43] The use of AI in this respects would be useful in strengthening the six pillars of health systems, namely health systems leadership and governance, the health workforce, health information systems, health systems financing, health service delivery, and access to essential medicines.[44]

Regarding health leadership, the potential of AI can and ought to spur a rethinking of solutions and interventions on the continent. This would in turn lead to the earlier

40 Ibid.
41 Ibid.
42 USAID: 'Artificial intelligence in global health: Defining a collective path forward'.
43 Ibid.
44 WHO: *Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies*.

discussed legislation stipulating use of AI in healthcare. Importantly also, the use of AI can help provide better population-wide understanding of disease prevalence to ensure the maximal utilisation of limited resources in the key hotspots. The use of AI can address challenges with surveillance and predication, contact tracing and the mapping of the spread of diseases, epidemiological monitoring, forecasting and predicative models for future pandemics, evaluation of population risk and subsequent management as well as intervention selection and targeting.[45] It can also help in better understanding health seeking patterns and health facility usage to better determine where more resources are needed. The goal with AI use by health leadership therefore ought to be the condensation and aggregation of data to help make better system-wide decisions that are timely, cost effective and as resource maximal as possible.

As discussed above, AI may best serve health workers, where it is used to automate or simplify administrative tasks and free them up to interact with patients. It can also be useful in managing patients over time and monitoring their progress, compliance, and adherence.[46] Regarding health-worker satisfaction and the need to mitigate against the ever increasing risk of skilled health-worker retention on the continent, the use of AI has to be a delicate balancing act, where its onboarding is not seen as an added task on an already overburdened healthwork force, nor viewed with apprehension as a replacement, intended to kick health workers out of their jobs. Therefore, as much of the incorporation of AI into health service delivery should be done in collaboration and in consultation with health workers. This approach also has the potential to be more successful if it focuses on the issues where health workers indicate that they face challenges and require technological assistance.

One such area where technological assistance is greatly needed is in the aspect of health record keeping and management, which in turn is an area where significant work is being done on AI interventions.[47] AI has already shown significant promise and has been shown to be an effective tool for collating, storing, filing, and analysing health records.[48] Layered unto its ability to mitigate against perennial health record loss is its ability to better utilise all the information in those records to analyse and correlate symptoms and make prognosis of patient's health issues.[49] However, the use of AI in this instance will built on quality electronic records and their management. While work is being done to improve on the use of electronic records in health systems on the continent, AI interventions can maximise existing technologies and better incorporate patients into the record keeping process through personal health monitoring. Furthermore, AI can assist in quality assurance, fraud detection and prevention, health worker training, human resources optimisation,[50] all of which would improve both health information systems and health systems financing.

Regarding access to essential medicines, AI can prove useful for drug discovery, enabling accurate and rapid genomic and proteomic analysis to develop targeted drugs, subsequent safe drug testing and the optimisation of clinical trials, as well as the

45 USAID.
46 Ibid.
47 Douglas MD and Brown EW 'Artificial intelligence in medical practice: the question to the answer?' at 129–133.
48 Ibid.
49 Ibid.
50 Ibid.

improvement of supply chains.[51] Together, all these interventions will help improve healthcare delivery, health systems responsiveness and health user satisfaction. It is thus for this reason that the use of AI ought not to be left to the domain of private innovation alone. Increased state backing, funding and institutional support is important for the maximisation of AI's inherent utility. A key advantage of a more collaborative outlook between private innovators and government institutions is that AI solutions are more likely to be purpose built, drawing from a better understanding of the issues that plague the health system.

While regulator-industry relationships often become adversarial, for the uptake of AI to work optimally for the delivery of health goods and services in Africa, there must be cooperation between the two without undue influence or the capitulation of the regulator. Such cooperation can help prevent the unnecessary duplication of efforts while guaranteeing healthy competition in the market and ensuring that the interventions proposed are for actual and not simply contrived problems in the healthcare system and value chain. Ultimately, with regulation, the goal must be to ensure synergy between emerging forms of health interventions with existing systems, and the practitioners that make those systems operate. Without building on and building with the existing structures of the health systems, two parallel systems of healthcare will be created with neither able to fully address the needs of the citizenry, whose health needs must be central to the health interventions used.

8.7 Conclusion

AI in healthcare if properly regulated and implemented can be a net positive for the realisation of health goods in Africa. However, if it is to be effectively regulated, there ought to be clear definitions of relevant terms and the contexts in which use is envisaged. Contrary to the usual nature of law being reactive, there needs to be a certain level of proactiveness when it comes to AI in healthcare. The law must be clear about the parameters of engagement and how far it is willing to concede, as well as why said concessions are being made. The protection of human rights against potential abuse must trump any fears of calcification which often prompt the legislator to be lax in the extent to which it will regulate in the bid to enable and encourage innovation. Innovation must be shown to serve humanity and not the other around.

Ultimately, in the quest for better healthcare delivery, the starting point must be clearly determining the desired health outcomes at the individual and population wide level. This may then be followed by a determination of if, when and where technology may help realise these desired outcomes. While innovation can be a good thing, it ought to be channelled at the issues that have continuously appeared insurmountable. Change for its own sake or, worse still, for the maximisation of profit for a few, cannot be the primary driver of how healthcare is provided, especially where there are already existing systemic barriers to access that can result in the replication of unjust health outcomes. AI in healthcare must be in service of the realisation of affordable, accessible care that is of good quality and is the fullest expression of the fulfilment of the right to healthcare.

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51 Ibid.

8.8 References

Adair-Rohani H, Zukor K, Bonjour S, Wilburn S, Kuesel AC, Hebert R and Fletcher ER 'Limited electricity access in health facilities of sub-Saharan Africa: a systematic review of data on electricity access, sources, and reliability' *Global Health: Science and Practice* 1.2 (2013) 249–261.

Azevedo MJ 'The state of health system(s) in Africa: challenges and opportunities' *Historical Perspectives on the State of Health and Health Systems in Africa* Vol. II (2017) 1–73.

Brandusescu A, Freuler JO and Thakur D 'Artificial Intelligence: Starting the policy dialogue in Africa' (Washington DC: World Wide Web Foundation, 2017).

Donnelly D 'First Do No Harm: Legal Principles Regulating the Future of Artificial Intelligence in Health Care in South Africa' *Potchefstroom Electronic Law Journal (PELJ)* 25.1 (2022) 1–43.

Douglas MD and Brown EW 'Artificial intelligence in medical practice: the question to the answer?' *The American Journal of Medicine* 131.2 (2018) 129–133.

Dyrbye, Shanafelt TD, Sinsky CA, Cipriano PF, Bhatt J, Ommaya A, West CP and Meyers D 'Burnout among health care professionals: a call to explore and address this underrecognized threat to safe, high-quality care' National Academy of Medicine *Perspectives* (2017).

Khullar D, Casalino LP, Qian Y, Lu Y, Krumholz HM and Aneja S 'Perspectives of patients about artificial intelligence in health care' *JAMA Network Open* 5.5 (2022) e2210309-e2210309.

McKee M and Wouters OJ 'The Challenges of Regulating Artificial Intelligence in Healthcare: Comment on Clinical Decision Support and New Regulatory Frameworks for Medical Devices: Are We Ready for It? – A Viewpoint Paper' *International Journal of Health Policy and Management* 12 (2023).

Mirzoev T and S Kane 'What is health systems responsiveness? Review of existing knowledge and proposed conceptual framework' *BMJ Global Health* 2.4 (2017) e000486.

OECD: 'Recommendation of the Council on Artificial Intelligence' OECD/LEGAL/0449.

Oleribe OO, Momoh J, Uzochukwu BSC, Mbofana F, Adebiyi A, Barbera T, Williams R and Taylor-Robinson SD 'Identifying key challenges facing healthcare systems in Africa and potential solutions' *International Journal of General Medicine* 12 (2019) 395.

Owoyemi A, Owoyemi J, Osiyemi A and Boyd A 'Artificial Intelligence for Healthcare in Africa' *Frontiers in Digital Health* 2 (2020) 6.

Reader TW, Gillespie A and Roberts J 'Patient complaints in healthcare systems: a systematic review and coding taxonomy' *BMJ Quality & Safety* 23.8 (2014) 678–689.

Sallstrom L, Morris OLIVE and Mehta H 'Artificial intelligence in Africa's healthcare: ethical considerations' *ORF Issue Brief* 312 (2019).

Trocin C, Mikalef P, Papamitsiou Z and Conboy K 'Responsible AI for digital health: a synthesis and a research agenda' *Information Systems Frontiers* (2021) 1–19.

USAID: 'Artificial intelligence in global health: Defining a collective path forward' (2019) <https://www.usaid.gov/cii/ai-in-global-health> (accessed 22 July 2022).

Vota W 'Every African Country's National eHealth Strategy or Digital Health Policy' <https://www.ictworks.org/african-national-ehealth-strategy-policy/#.YwSeC3ZByM8> (accessed 20 July 2022).

West SM, Whittaker M and Crawford K 'Discriminating systems' *AI Now* (2019).

WHO: *Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies* (World Health Organization, 2010).

Chapter 9

Just because you can, doesn't mean you should: The case for and against utilisation of artificial intelligence for indigenous-knowledge curation and preservation in Kenya

9.1 Introduction

Access to knowledge systems is essential for socio-cultural and economic development. Artificial intelligence (AI) may be utilised to ensure equitable and inclusive access to knowledge.[1] AI may close the gap between privileged and non-privileged persons by providing learning opportunities to marginalised communities and groups, those with disabilities, and those in isolated communities among others.[2] This access will be a step towards achieving the Sustainable Development Goal 4 aimed at inclusive and equitable quality education and the promotion of lifelong learning opportunities for all.[3] It will also fulfil the objectives of the knowledge (A2K) initiative, which refers to the right to participate in the creation, distribution, and acquisition of raw information, secondary analyses of data, and knowledge-embedded tools and services.[4]

Unfortunately, indigenous knowledge (IK) – especially, tacit knowledge, that is to say, knowledge that is largely experience based –is often devalued.[5] As a consequence, AI technology and data analytic tools are often developed in a manner that excludes IK or allows for communities to utilise them to support existing IK practices. Knowledge, like most things in societies, is an inherently political issue. Its definition, production and dissemination are heavily influenced by power politics in the global arena.[6] In this vein, mainstream knowledge discourse is dominated by Western (or Eurocentric) establishments.[7] A singular perspective of knowledge exists that leans towards the

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1 UNESCO Education Sector: 'Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development'.
2 Ibid.
3 UN Department of Economic and Social Affairs: 'Sustainable Development Goal 4'.
4 Yale Law School Information Society Project: 'Access to Knowledge'.
5 Dei GJS 'Rethinking the Role of Indigenous Knowledge in the Academy'; Wheeler HC et al. 'The need for transformative changes in the use of Indigenous knowledge along with science for environmental decision-making in the Arctic'.
6 Odhiambo OJ 'Indigenous Intellectual Traditional in Kenya: Oral Citation Style among the Luo in Kenya' at 37.
7 Ibid. See also Mignolo WD *The Darker Side of the Renaissance: Literacy, Territoriality, and Colonization* who states that 'knowledge flows in the same direction as money: from the West to the rest of the World'.

dominant knowledge cultures as the universal epistemic traditions.[8] That these indigenous/traditional systems are often derived from and associated with specific groups of people who were colonised (and thus had to adopt writing rather than oral traditions) only goes further to bolster antiquated and biased views of these diverse systems.[9] The reality is that these two systems (the Western/Eurocentric and the indigenous/traditional systems) continue to coexist within communities.

The importance of IK and a trend towards interdisciplinary research that recognises tacit knowledge as valuable are, however, increasingly recognised; this is especially so in disciplines that deal with culture-rich themes such as art that now seem to collide with technology fields for curation and information management.[10] For example, one of the policy considerations of the A2K initiative includes the preservation of IK.[11] Viewing the A2K initiative as an interpretation of the right to freely participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits[12] means that cultural life, the arts and scientific advancement are all on the same side of the coin – all enjoy the same prominence as a right.

The Eurocentric view of knowledge as property is globally dominant and holds the highest currency. This 'property' fuels innovation and, subsequently, social and economic progress. AI has (and is) exponentially increasing this process. It is important to consider the place, and status, of IK in the knowledge economy; the possible impact of its inclusion or exclusion in AI enabled knowledge systems, and the consequences to communities whose participation in this economy primarily relies on IK with the advent of increased AI adoption. Historically, scholarly traditions that homogenise diverse indigenous cultural practices have resulted in a flattening of the rich texture and variability of Indigenous thought.[13] The question then becomes, what methodologies and technological practices should be brought to bear on the problem of 'AI and IK curation'.

To address this will require answering the following questions: In what ways do current AI practices aid and hinder the collation, preservation, and dissemination of IK? What are the possible impacts of these current practices when it comes to the cultural and commercial applications of IK? And finally, what are the relevant ethical and policy considerations to ensure the inclusion, preservation, and access to IK?

Kenya is used as a test case for this analysis. To answer the questions raised in the previous paragraph, we assess the role and impact of IK in Kenya; the current practices in collating IK in the country, and policies that pertain to IK preservation and utilisation. With Kenya's diverse ethnic makeup, IK plays a critical role not only in the survival of local communities in Kenya but also in their socioeconomic development, and the economic progress of the country as a whole. IK is an integral part of the practices and informs decisions in many economic sectors in the country. IK is leveraged in the

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8 Odhiambo at 37.

9 Ibid. at 38.

10 O'Neill B and Stapleton L 'Digital cultural heritage standards: from silo to semantic web'. With a shift towards culture-rich research that is interdisciplinary, research teams are required to work in teams consisting of the 'knowledge' experts (librarians/curators) and developers. The tacit knowledge of the team members in this context needs to be valued.

11 Ibid.

12 See the Universal Declaration of Human Rights art. 27(1).

13 Lewis JE (ed.) 'Indigenous protocol and artificial intelligence position paper'.

country's tourism industry, for example. Any technology, such as AI, that can be utilised to better leverage IK for the benefit of the nation and its communities is worth exploring.

9.2 Collation, preservation and dissemination of indigenous knowledge in Kenya using artificial intelligence technologies: Strategies and concerns

Current practices utilising AI to collate, preserve, disseminate, and even create knowledge are largely dependent on the types of knowledge in question as explicit, implicit, or tacit. Availability of training data differs with each type of knowledge. Explicit knowledge – knowledge acquired on topics and in ways that are easy to document – is the dominant type of knowledge dealt with in AI systems. Implicit knowledge (applied information) and tacit knowledge (understood information) often exist in 'non-documented' states and are, therefore, harder to digitise and utilise in AI platforms. While it is harder to create databases of 'tacit knowledge', it is not impossible; several such databases are in existence.[14]

In Kenya, implicit and tacit knowledge are a large and important part of the national knowledge pool. IK is often of a practical nature, for example knowledge of medicinal properties of certain plants or local weather patterns that govern planting schedules, and passed down from generation to generation using oral traditions. AI may be utilised in preserving and disseminating this knowledge but there are a number of obstacles that must first be overcome.

First, documenting and then digitising this knowledge must be done. This can be difficult as access to these sources is required. Traditionally, the transmission medium for knowledge in indigenous groups is often personal communication or demonstration, for example from the tutor to the pupil or the apprentice; and or from parents to children.[15] In the present era, documentation of this knowledge may be done by internal or external parties within the community of interest. Indigenous communities with access to digital technologies (and the know-how) may collect and preserve the communal knowledge using these digital tools. Alternatively, external parties (government organisations or private entities) may assist these communities in preserving their traditional knowledge by developing heritage digitisation and preservation programmes.[16] However, in some cases, gaining access to the human repositories of knowledge in indigenous communities is simply not feasible. Lack of funding and expertise to facilitate collection of this information are some of the primary challenges.

Where data can be collected and digitised, databases that may be utilised in the development of AI can be created. However, presently, Kenya is predominantly a

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14 CHM: Convention on Biological Diversity; WIPO: 'Inventory of Existing Online Databases Containing Traditional Knowledge Documentation Data; IEAE: 'Mutant Variety Database: International Atomic Energy Agency'; UPOV: PLUTO Plant Variety Database.

15 Christian GE 'Digitization, intellectual property rights and access to traditional medicine knowledge in developing countries: the Nigerian experience'; Odongo R 'A Framework for Developing a Knowledge Base for Indigenous Ecological Knowledge in Uganda' at 207–221; Kemoni HN 'Challenges of Documenting Indigenous Knowledge in Kenya'.

16 See The Europeana Project; NDHA New Zealand: Digital preservation; American Memory Collection and Australian Digital Collection.

consumer and not a developer of AI technologies. It is unclear whether current development practices, engendered primarily by technological companies in the USA, EU and China and utilised mostly on explicit knowledge, may be effectively employed to process tacit knowledge from Kenya's indigenous communities. Moreover, the impact of any bias present in these AI tools – a result of the human bias of the AI developers that seep into the algorithms and datasets – is yet to be determined. The question now arises whether it would be necessary to develop entirely new design protocols for the development of these tools when utilising IK datasets.

Similar concerns arise when considering IK datasets. What impact does decontextualising this knowledge from its local community and environment have in the development of AI? Can the AI identify patterns within the data accurately without an understanding of the cultural context? Can programmers script algorithms that account for this cultural context without fully grasping the nuanced value and implications of IK to indigenous communities? The question of whether repurposing historically violent disciplines, knowledge projects and technologies may realise the decolonial futures that the African people hope for is also one the needs to be investigated.[17] Current data practices (and activities in the digital sphere) can be exploitative to brown and black bodies and also enrol them as the data-labourers to assemble the global datafication.[18]

Issues of access and ownership of data collected from indigenous communities are also of concern. Who owns the data collected from indigenous communities? Who can access and utilise the data? What of monetary compensation to the communities from which this data is collected? Who should benefit from the development of AI technologies from this data and commercialisation of IK? Largely, intellectual property (IP) law is used to protect IK and the communities it originates from. However, in the case of IK, the efficacy of these legislations is contested since IK cannot be fully or properly accounted for through the Western-oriented prism of patents, copyrights, trademarks and other formal IP outputs.[19] For example, patents are generally designed to reward individuals or individual corporate entities with monopoly ownership of certain knowledge, yet IK is often collaborative and incremental, relying on a community's insights and know-how often built up over generations.[20] Arguments that IK is part of the 'public domain' and therefore does not merit IP protection further disenfranchise indigenous communities. Recent arguments by scholars on the issue call for a custom-built public domain for IK – one that reflects indigenous conceptions and balances the rights of indigenous peoples and local communities with the public at large.[21] A 'tiered approach' that 'provides a framework for delineating different kinds of TK and TCEs based on their degrees of diffusion, or lack thereof' has also been put forth as a solution for the 'public domain' concern as it pertains to IK.[22] If AI is to be ethically developed using (and for) IK, IP laws must be strengthened to offer (i) full protection to the

17 Raval N 'An agenda for decolonizing data science' at 1–6.
18 Ibid.
19 De Beer J et al. (eds.) *Innovation & intellectual property: Collaborative dynamics in Africa*; Nwankwo U and Kenny C 'Their Knowledge, Their Rights: Using Traditional Knowledge and Intellectual Property to Protect Communities'.
20 Nwankwo and Kenny ibid.
21 Okediji R 'Traditional Knowledge and The Public Domain' at 176.
22 Oguamanam C 'Towards a tiered or differentiated approach to protection of traditional knowledge (TK) and traditional cultural expressions (TCEs) in relation to the intellectual property system' at 1–24.

indigenous communities from which the data is extracted; (ii) means to obtain monetary compensation for products derived from this knowledge, and (iii) accessible and easy means of redress in case of infringement.

9.3 The possible impact of utilising artificial intelligence to preserve and disseminate indigenous knowledge in Kenya

Utilising AI to preserve or disseminate IK to local communities in Kenya is likely to have a monumental impact on the country. There is concern that with the passing of the older generations, a large amount of the country's IK will be lost.[23] Moreover, migration (rural to urban migration being dominant in Kenya's rural regions) of community members from their communities fractures the totality of IK available within the community – many important pieces of information and practices are lost in this manner. Rapid population growth, changes in educational systems, environmental degradation, and development processes (all leading to lifestyle changes, modernisation and cultural homogenisation) are also contributing to the loss of IK.[24] Digitising this knowledge to preserve it would secure its access to future generations. However, this course of action is not without potential pitfalls. First, while digitisation of IK can enable indigenous communities to gain control over their cultural knowledge (opening new avenues for them to benefit from), it can also have the opposite effect. Exploitative commercialisation practices of this knowledge are detrimental to the economic progress of indigenous communities. Consider the case of Katempfe and serendipity berries (tropical fruits native to West Africa and long used by people in that region for their sweetening properties). The University of California and Lucky Biotech, a Japanese corporation, were granted a patent for the sweetening proteins (thaumatin, a substance that is 2000 times sweeter than sugar, yet is calorie free) derived from these West African plants without offering compensation or benefits from this knowledge to local communities.[25] While protocols have been established to guide commercialisation of TK – obtaining consent from the indigenous communities and signing protocols like the Material Transfer Agreement (MTA) and Access and Benefit Sharing (ABS) between all involved parties – these are not always adhered to and in the case of violations, redress is often an expensive and protracted process.

Even in the cases of material resources, it is often difficult for indigenous communities in Kenya to advocate for themselves, regardless of the policies, laws[26] and protocols in place. Using AI to collate traditional e-practices on the application of material resources by indigenous communities might exacerbate the problem of commercial exploitation. AI would provide unfettered global access to TK from Kenya's indigenous communities. It would be difficult to regulate (or enforce regulations) on how this information is used. Unscrupulous companies may make use of this IK for commercial purposes without consent (or even knowledge) of the affected parties. Access to this IK may also lead some individuals or commercial entities to fraudulently claim ownership and try to cement this dubious claim by legal means. For example, in 2006, a UK

23 Thairu W 'A Critical Analysis of The Impact of Digitizing Indigenous Knowledge' at 51–73.
24 IIRR: 'Recording and using indigenous knowledge: a manual' at 211.
25 Roht-Arriaza N 'Of seeds and shamans: The appropriation of the scientific and technical knowledge of indigenous and local communities' at 919.
26 Kenya's Protection of Traditional Knowledge and Cultural Expressions Act No. 33 of 2016.

company filed an application to register the word 'Kikoy' as a trademark for textile goods. Kikoy is a bastardisation of the Kiswahili word 'kikoi' which refers to distinctive, colourful wrap cloths that have been woven and worn by men and women across East Africa for decades. The application would have given the company sole commercial rights to the term 'Kikoy' and hindered many in the East African business community who create these textiles, often using traditional means of production, from accessing the UK market. Many East Africans would lose their livelihoods and, perversely, their freedom to use a word from their own language. Although the application was ultimately rejected,[27] it illustrates the potential dangers of granting a global market access to TK. It is difficult, though, to envisage how IK can escape the clutches of the ongoing Fourth Industrial Revolution (4IR). Rather, it would be prudent to concede its inevitability and pursue legal safeguards to ensure equitable benefits from the utilisation of AI in preserving and disseminating IK.

AI coupled to IK has the potential to be a powerful driving force for economic growth and sustainable development in Kenya. Agriculture is the backbone of Kenya's economy. 70% of the output in this sector is derived from rain-fed small-scale farming. Consequently, extreme weather phenomena, for example droughts and floods, are often disastrous. Rural farmers (the majority of Kenya's farmers) utilise IK to predict droughts and also to implement unique coping strategies passed down through generations.[28] This type of knowledge coupled to modern science and technological innovations may hold the key to resolving the country's food security problems. AI enabled predictive climate models trained with conventional datasets as well as data generated from IK might be more accurate by offering more nuanced information on a particular locale. Currently, most available climate models are developed in the USA or Europe. The efficacy of these models when applied to countries in the global south is often less than when applied to environments in the USA or Europe. The climate models often fail to capture the magnitude of predicted weather phenomena.[29] The training datasets are the main culprits in this. Limited access to observational data results in incomplete datasets and poor understanding of the climate features in the continent. Incorporation of IK as data in training the climate models may mitigate these issues. Greater predictive accuracy will allow nations, communities, and individual farmers to develop better strategies to protect crop yields.

Digitising IK via AI also raises questions on information access and narrative control, for example access to sacred information. Making sacred knowledge public, as AI technology would likely do, would impinge on the religious rights of communities who hold this information to be sacred and accessible only to members of their community. In a 1976 legal case in Australia, for example, the Federal Australian court granted an injunction in favour of members of the Pitjantjatjara council, an indigenous group, who argued that the wide dissemination of certain information collected in an anthropological study could cause serious disruption to Pitjantjatjara culture and society should it be revealed to women, children and uninitiated men.[30] If this study had occurred 30 years

27 Nzomo V 'The Intellectual Property Tale of How Kenya Almost Lost the Kikoi Fabric'.

28 Masinde M & Bagula A 'ITIKI: bridge between African indigenous knowledge and modern science of drought prediction' at 274–290.

29 James R et al. 'Evaluating climate models with an African lens' at 313–336.

30 Janke T 'Managing Indigenous Knowledge and Indigenous Cultural and Intellectual Property' at 99–111.

later, this information would possibly have been disseminated on the internet resulting in grievous harm to the Pitjantjatjara people. In Kenya, the Mijikenda people (a Bantu-speaking people consisting of nine sub-communities: the Chonyi, Digo, Duruma, Giriama, Jibana, Kambe, Kauma, Rabai, and Ribe, who are all related culturally and linguistically),[31] restrict who has access to the community's healing knowledge. Transmission of healing knowledge is complex and determined by the elders through a rating process assessing the personal conduct and motive of the applicant or given to an individual healer by a family member or friend through an apprenticeship and after payment of a predetermined monetary token.[32] Global access to this knowledge would infringe on the Mijikenda people's rights. Such issues raise ethical dilemmas on what IK should be digitised and who should determine that.

The global community may utilise IK available on AI platforms, and decontextualised from its geographic and cultural setting, to further biased and discriminatory narratives and practices about Kenya and its people. For much of the 20th century and earlier, Europeans framed indigenous nations (their people and culture) all over the world as ignorant, culturally and socially backward, even primitive, with nothing to offer a new and exciting modern society. Positive valuation of IK and cultural diversity is a recent development. This evolution in ideology, sometimes referred to as 'decolonisation', is not accepted everywhere. Bias of Africa and its people still thrive. How would this impact the preservation of IK using AI? Innate algorithmic bias and bias in the datasets, might skew outputs on IK, painting originators of this knowledge in an unfavourable light. Roberto Borreo, a consultant at the International Indian Treaty Council, voiced a common complaint of indigenous groups dealing with technology developers stating: 'Some game developers just appropriate Indian culture, they use our stories and symbols without any benefits to the communities. They represent us [Taino people] as violent or primitive, and we do not need to encourage any more racism or violence against indigenous communities.'[33] This may have very dire consequences. Numerous studies, for example, have shown that many AI platforms used to predict recidivism are biased.[34] It is not difficult to believe that similar technology may use decontextualised IK in its database to systematically disenfranchise indigenous communities.

9.4 Ethical considerations and practices for indigenous-knowledge preservation and collation using artificial intelligence

Ethical frameworks for the development of AI tools to be used in the preservation and dissemination of IK should be based on the understanding that IK

(i) is just as valuable as explicit knowledge obtained from modern day activities;

(ii) may be incompatible with Western or European epistemology;

(iii) is intrinsically linked to the communities of its origin;

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31 Ongugo PO et al. 'Protecting traditional health knowledge in Kenya: The role of Customary Laws and Practices'.

32 Ibid.

33 Vesper I 'Indigenous People Need Control Over Digital Tech'.

34 Hao K 'AI is Sending People to Jail, and Getting it Wrong'; Saunders J et al. 'Predictions put into practice: a quasi-experimental evaluation of Chicago's predictive policing pilot' at 347–371.

(iv) and practices have monetary value;
(v) is owned by the people it originates from – it is not part of the public domain; and
(vi) is data that is controlled by indigenous communities.

The parameters of access to such knowledge requires a different value system and ethical considerations that acknowledges the unique characteristics of IK. By definition IK relates to specific cultures; preservation of ownership by these communities should take precedence over data collection for machine learning purposes. Data collection frameworks must include mandates

(i) to obtain informed consent from participants before data collection;
(ii) to provide information on the proposed utilisation of the collected data and its possible impacts to the community;
(iii) to ensure data ownership of the collected data is retained by the community of origin (communal ownership is acknowledged rather than the individual ownership favoured by IP laws);
(iv) to provide the indigenous communities from whom data is collected with easily accessible venues for redress in case of data exploitation; and
(v) to provide indigenous communities with means to withdraw the data provided should the need arise.

These mandates would ensure that indigenous groups in Kenya retain control over their data and have a say in how it is utilised. They secure monetary compensation for these communities in the event of commercialisation of their IK. Additionally, not only do the mandates outlined above establish a means of redress for the communities if data exploitation occurs, but they also ensure that communities can take their data back and destroy it if it causes problems for them in the future.

There should also be recognition of the role that technology has played, historically, in the disenfranchisement of marginalised groups. AI tools must account for and mitigate historical bias (systematic or otherwise) experienced by indigenous communities. The AI development process should be inclusive, featuring a variety of diverse voices to mitigate issues of bias from the developers. When developing AI for preservation of IK, it may also be necessary to completely revise current scientific practices since IK may be at odds with Western attitudes on data and technology. A 2021 paper by Abdilla et al. proposes indigenous protocols for AI development.[35] The study in the paper forges a link between AI design, computation, and indigenous practices. Abdilla et al. argue that to create AI that is not disadvantageous to indigenous groups,

> 'issues of exclusion, privilege and ethics are addressed as part of the algorithmic process in a way that ensures bountiful opportunity for society at large . . . From an Indigenous worldview that privileges communal wellbeing, wholeness and balance, we explore Western cultural notions of "intelligence" within AI to begin creating an alternate conceptual foundation – principles and processes that support our future dreamings of AI.'[36]

The study also concludes that 'indigenous AI' to be regional in nature, conception, design and development, to be tethered to localised indigenous laws inherent to the land and community.[37] This means that AI technologies to preserve IK of Kenyan

35 Abdilla A et al. Out of the Black Box: 'Indigenous protocols for AI'.
36 Ibid.
37 Ibid.

communities should, ideally, be developed in the country, or at the very least, developed with extensive input from the indigenous communities in Kenya whose knowledge they seek to preserve.

Current IP laws, both in Kenya and around the globe, protecting IK and any technologies that deal with IK should also be re-evaluated. IP laws largely promote a Western understanding and interpretation of knowledge, ownership, authorship, private property and monopoly privilege which do not necessarily align with indigenous people's interpretation and understanding of knowledge systems and knowledge practices.[38]

9.5 The policy frameworks required to ensure inclusive and equitable access to indigenous knowledge via artificial intelligence

Policy frameworks may include legislation, guidelines, recommendations, and directives among other things. Currently, protection of IK is largely done using IP laws. However, there are gaps in the protection offered by these laws as it pertains to IK, mainly due to the discrepancy between Western understanding of knowledge systems and that of indigenous people. There is, at present, no legislation specific to AI enacted in any of the 55 African countries. Notably, there are a range of initiatives by several African countries (Kenya, Tunisia, South Africa, Mauritius and Ghana) that are relevant to the development of AI.[39] Kenya specifically has a Blockchain and AI Taskforce that has recommended the use of AI to eliminate corruption, strengthen democracy, facilitate financial inclusion and improve the delivery of public services among other things.[40] Nevertheless, there is not yet an initiative that covers the potential intersections between AI and IK.

There is a need for policies on access to tools developed using IK by the communities in which this knowledge originates. There should be checks and balances against 'cherry picking' of information, and of value systems.[41] There should be verification protocols towards the deployment of the tool to ensure that it meets the values and ideologies from where it is obtained.

It should be noted that the establishment of policies would be the first step in a multi-level process that would require policy makers, educators and developers take an active step in understanding and implementing IK systems and integrating these knowledge systems in the development process of technologies such as AI. Several initiatives will need to follow this first step to achieve an equitable and inclusive environment.

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38 Anderson J 'Indigenous/traditional knowledge and intellectual property'; Simeone T 'Indigenous traditional knowledge and intellectual property rights'; Feris L 'Protecting traditional knowledge in Africa: Considering African approaches' at 242–255.

39 Hu X et al. 'Steering AI and advanced ICTs for Knowledge Societies: A Rights, Openness, Access and Multi-stakeholder Perspective'. The 2019 Government Artificial Intelligence Readiness Index places 12 African countries in the top 100 and none in top 50 with regard to the Government's Readiness to use AI under four broad clusters that include Governance, Infrastructure and Data, Skills and Education and Public Services.

40 MICT. *Emerging Digital Technologies for Kenya: Exploration & Analysis*.

41 See Kenya specifically has a Blockchain and AI Taskforce.

The IK legislative landscape must be updated to account for the interaction between AI and IK knowledge systems. Currently the legislation that exists within the Kenyan landscape views IK through the lens of an IP framework. While this may address certain issues that overlap between AI and IP such as ownership, it must consider issues such as data protection and data management. Though solutions to these issues may be inferred from the right to privacy and other national laws regarding data protection, having specific articles that address this would go a long way in cementing the value of IK knowledge systems and how they interact with AI technology.

Kenya promulgated a Data Protection Act[42] in 2019. It is now the primary law on data protection in the country. The purpose of the Act is to provide individuals' rights and privacy as they pertain to data. It gives effect to article 31 of the Kenyan Constitution[43] that stipulates that privacy is a fundamental right. The Act, however, does not offer any provisions that relate specifically to AI technologies. The DPA does not provide any mandates specific to data from IK either. Policies that extend the DPA to cover both these topics are needed.

Data collection, storage, and processing processes of IK should prioritise protection of indigenous communities. These policies should explicitly enshrine control of any data collected from indigenous communities to those communities. Control in this case means the ability to dictate how and when their data is used; who it is used by; who benefits from it, and the means to retract either the data or permission to utilise it. Additionally, policies relating to the preservation, dissemination and utilisation of IK with AI should explicitly mandate compensation of indigenous communities should their data be utilised by external parties for commercial purposes. Noncompliance with this mandate should constitute data exploitation and should come with legal and fiduciary consequences.

Policy frameworks should also provide strategies for policymakers and data officers to (i) establish strategies and best practices on working with indigenous communities in reviewing existing DPA laws to determine their efficacy in protecting these communities; (ii) enforce existing DPA laws in cases that affect the rights of indigenous communities; (iii) establish definitions and understanding of knowledge systems and data with indigenous communities that differ from those that are currently in use; (iv) offer mechanisms for educating and training indigenous communities on data and AI; and (v) offer easily accessible venues of redress to indigenous communities. National policy frameworks establishing, and outlining the hierarchical structures of a government office to deal with AI matters are also needed. An office dedicated solely to AI within the government will provide the public with information on the roles and responsibilities of officers in the office which will allow them to direct their concerns and complaints to the right party. National policy frameworks must establish and define the roles of the persons who will be responsible for the future policy development, dissemination, maintenance and review on the intersectionality of AI and IK.

Policies that facilitate and promote establishment of 'indigenous AI' in the country are needed as well. In this case, indigenous AI refers to AI that is developed centring

42 Act No. 24 of 2019 (DPA) <http://kenyalaw.org/kl/fileadmin/pdfdownloads/Acts/2019/TheDataProtectionAct__No24of2019.pdf>.

43 Constitution of Kenya, 2010 <http://www.kenyalaw.org/lex/actview.xql?actid=Const2010>.

the priorities and needs of indigenous communities utilising ethical- and human-centred approaches. Processes for indigenous AI development should begin with a critical analysis of the current procedures and an honest assessment of how they may (or do) contribute to the disenfranchisement of indigenous communities in Kenya. Procedures that negatively impact or lead to products that negatively impact local communities must be discarded and replaced with new methodology designed in consultation with local communities or their representatives. Developers must carry out assessments to evaluate if the procedures utilised adhere to the four ethical principles of beneficence, non-maleficence, justice and autonomy in relation to the AI under development and impacted stakeholders. Similarly, the end-product must be evaluated not only to assess its performance but to determine any detrimental impacts it may have on the populace in general, and, particularly, on the source of the IK it utilises. Indigenous communities must have oversight through the entire development process and, more importantly, the ability to veto any activities that may harm them. Sustainable development of these technologies is of paramount importance. Policies strictly prohibiting weaponisation of IK by AI platforms must be enacted and the consequences of non-compliance established.

Finally, the topic of accountability should be addressed in policy frameworks developed to regulate the curation of IK by AI technologies. Policies for accountability must be categorised into three functions: (i) accountability within organisations that develop AI technologies; (ii) accountability in government; and (iii) accountability for impacted indigenous groups. Organisations that develop AI must assign individuals or departments responsible to ensure compliance with existing laws and regulations pertaining to data and IK, and compliance with any future laws. The identity of the individual or office accountable for the organisation's compliance will be made public; names and contact information provided on platforms accessible to the general public. These organisations must also develop impact assessment protocols for their AI products.

Accountability from AI developers must encompass transparency and explainability. Organisations developing AI for the curation of IK must clearly explain: (i) the intended purpose of the AI system to the public and the impacted indigenous groups; (ii) the datasets utilised in the development of the AI system; (iii) the processes used by the AI to generate its output; and (iv) primary findings of impact assessments done for the developed AI product.

The frameworks must establish protocols for governments to identify accountability gaps in existing legal and regulatory frameworks. In accordance with the eight principles of the Responsible AI framework, governments must make accountability for AI as a human endeavour. Responsible AI assigns direct legal accountability for any harm resulting from organisations that develop, deploy, or use AI systems, reinforcing the need for such systems to be safe and reliable;[44] governments may use this principle to assign accountability to stakeholders – mandating that humans be held accountable for any actions or omissions of AI systems. The policies within these frameworks must outline ways in which indigenous communities can ensure that AI benefits their community and causes no harm. This may include, but are not limited to, establishing means by which these communities may obtain training on issues related to AI, IK and data; providing venues and platforms for indigenous communities to advocate for themselves, and empowering members of these communities to successfully work in

44 Morgan C and Reineke E 'A Framework for Responsible Artificial Intelligence'.

AI development, policy, knowledge curation, or other sectors that directly impact their community.

9.6 Conclusion

IK is an essential social and economic pillar in Kenya. While the predominant knowledge systems in Kenya lean towards scientific Eurocentric ideologies, due to the history of the country, AI that incorporates IK in an ethical and inclusive manner may contribute to the country's growth and development. Preservation of IK using AI technologies will ensure that IK is not only available to future generations but for utilisation in activities to meet the country's social and economic development goals. While there are numerous potential benefits to this method of curating IK, there are just as many possible pitfalls. Chief among them is the exploitation of indigenous communities by external parties, both local and global. It is important that the law offers sufficient guardrails to protect these communities. Current IP and data protection laws are insufficient to deal with all the complexities surrounding AI, IK and the issues that arise when they intersect. New policies are required. These new policies should centre the needs and priorities of indigenous communities. They should enshrine control of IK data into the hands of indigenous communities and establish protocols for these communities to offer input and oversight in the development of AI technologies. The laws must establish compensation policies for indigenous communities where their knowledge is utilised for production of commercial goods or services.

9.7 References

Abdilla A, Kelleher M, Shaw R & Yunkaporta T Out of the Black Box: 'Indigenous protocols for AI' (2021).

American Memory Collection <https://memory.loc.gov/ammem/index.html>.

Anderson J 'Indigenous/traditional knowledge and intellectual property' (Center for the Public Domain Issues Paper, Duke University, 2010).

Australian Digital Collection <https://www.nla.gov.au/content/the-nature-of-the-library-s-digital-collections#>.

CHM: Convention on Biological Diversity <https://www.cbd. int/chm/>.

Christian GE 'Digitization, intellectual property rights and access to traditional medicine knowledge in developing countries: the Nigerian experience'; A research paper prepared for the International Development Research Centre (IDRC) Ottawa, Canada (2009) <http://idl-bnc.idrc.ca/dspace/handle/10625/41341>.

De Beer J, Armstrong C, Oguamanam C & Schönwetter T (eds) *Innovation & intellectual property: Collaborative dynamics in Africa* (Juta and Company (Pty) Ltd, 2014).

Dei GJS 'Rethinking the Role of Indigenous Knowledge in the Academy', NALL Working Paper (2002).

The Europeana Project <(https://www.europeana.eu/en>.)

Feris L 'Protecting traditional knowledge in Africa: Considering African approaches' *African Human Rights Law Journal*, 4(2), (2004) 242–-255.

Grenier, L 'Working with Indigenous Knowledge: A Guide for Researchers', (IDRC, Canada, 1998).

Hao K 'AI is Sending People to Jail, and Getting it Wrong' *MIT Technology Review* (2019) <https://www.technologyreview.com/2019/01/21/137783/algorithms-criminal-justice-ai/>.

Hu X, Bhanu Neupane B, Echaiz Lucia FE, Sibal P Prateek S et al. and Lam MR 'Steering AI and Advanced ICTs for Knowledge Societies: A Rights, Openness, Access and Multi-stakeholder perspective Perspective' UNESCO Series on Internet Freedom (2019) <https://en.unesco.org/unesco-series-on-internet-freedom>.

IEAE: 'Mutant Variety Database: International Atomic Energy Agency' (IEAE) <https://nucleus.iaea.org/sites/mvd/SitePages/Home.aspx>.

International Institute of Rural Reconstruction (IIRR): 'Recording and using indigenous knowledge: a manual' (Philippines: Silang, Cavite, Philippines, 1996).

James R, Washington R, Abiodun B, Hart N, Kay G, Mutemi J, Pokam WM, Artan G and Senior C et al. '(2018) Evaluating climate models with an African lens' *Bulletin of the American Meteorological Society* 99(2) (2018) 313–336.

Janke T 'Managing Indigenous Knowledge and Indigenous Cultural and Intellectual Property' *Australian Academic & Research Libraries* 36(2) (2005) 99–111.

Kemoni HN 'Challenges of Documenting Indigenous Knowledge in Kenya Conference Paper', KNET Workshop on Harnessing and Using Local Knowledge for Developmental Workshop, Sarova Panafric Hotel, Nairobi, Monday, (30th November 2009).

Lewis JE (ed.) 'Indigenous Protocol and Artificial Intelligence' Position Paper. (Honolulu, Hawai'i: The Initiative for Indigenous Futures and the Canadian Institute for Advanced Research (CIFAR, 30 January 2020) DOI:10.11573/spectrum.library.concordia.ca.00986506>.

Masinde M & Bagula A 'ITIKI: bridge between African indigenous knowledge and modern science of drought prediction' *Knowledge Management for Development Journal*, 7(3), (2011) 274–290.

Mignolo WD *The Darker Side of the Renaissance: Literacy, Territoriality, and Colonization* 2nd edn (Ann Arbor: The University of Michigan Press, 2002).

MICT: *Emerging Digital Technologies for Kenya: Exploration & Analysis* (July 2019) <https://www.ict.go.ke/blockchain.pdf>

Morgan C and Reineke E 'A Framework for Responsible Artificial Intelligence' Center for Association Leadership <https://www.asaecenter.org/en/resources/articles/an_ plus/2019/august/a-framework-for-responsible-artificial-intelligence#:~:text=Responsible %20AI%20places%20the%20notion,to%20be%20safe%20and%20relia ble>.

National Digital Heritage Archive (NDHA), New Zealand: 'Digital preservation' <https://natlib.govt.nz/collections/digital-preservation>.

Nikolaeva Koleva MN; Fernandez-ballester G 'In Silico Approaches for TRP Channel Modulation' *Methods Molecular Biology* 2019, 1987 187–206.

Njiraine D 'Mapping and auditing indigenous knowledge and its management environment: A comparative study of Kenya and South Africa' (PhD thesis: University of Zululand, 2012).

Nwankwo U and Kenny C 'Their Knowledge, Their Rights: Using Traditional Knowledge and Intellectual Property to Protect Communities' Center for Global Development (2021) <https://www.cgdev.org/blog/their-knowledge-their-rights-using-traditional-knowledge-and-intellectual-property>.

Nzomo V 'The Intellectual Property Tale of How Kenya Almost Lost the Kikoi Fabric' IP Kenya (2012) <https://ipkenya.wordpress.com/2012/01/16/the-intellectual-property-tale-of-how-kenya-almost-lost-the-kikoi-fabric/>.

Odhiambo OJ 'Indigenous Intellectual Traditional in Kenya: Oral Citation Style among the Luo in Kenya' *African Review* 41(2) (2014) 33–54.

Odongo R 'A Framework for Developing a Knowledge Base for Indigenous Ecological Knowledge in Uganda' *ESARBICA Journal* Vol. 28 (2009) 207–221.

Oguamanam C 'Towards a tiered or differentiated approach to protection of traditional knowledge (TK) and traditional cultural expressions (TCEs) in relation to the intellectual property system' *The African Journal of Information and Communication* 23 (2019) 1–24.

Okediji R 'Traditional Knowledge and The Public Domain' Centre for International Governance Innovation Papers (2018) 176.

O'Neill B and Stapleton L 'Digital cultural heritage standards: from silo to semantic web' *AI & Society* (2022) <https://doi.org.ezproxy.library.strathmore.edu/10.1007/s00146-021-01371-1>.

Ongugo PO, Mutta DN, Pakia M & Munyi P 'Protecting Traditional Health Knowledge in Kenya: The Role of Customary Laws and Practices' (October 2012).

Owuor J 'Integrating African Indigenous Knowledge in Kenya's Formal Education System: The Potential for Sustainable Development' *Journal of Contemporary Issues in Education* 2(2) (2007) 21–37.

Quijano A 'Coloniality and Modernity/Rationality' *Cultural Studies* 21 2 & 3 (2007) 168–178.

Raval N 'An agenda for decolonizing data science' *Spheres: Journal for Digital Cultures* 5 (2019) 1–6.

Roht-Arriaza N 'Of seeds and shamans: The appropriation of the scientific and technical knowledge of indigenous and local communities' *Michigan Journal of International Law* 17(4) (1995) 919–965.

Saunders J, Hunt P & Hollywood JS 'Predictions put into practice: a quasi-experimental evaluation of Chicago's predictive policing pilot' *Journal of Experimental Criminology* 12(3) (2016) 347–371.

Simeone T 'Indigenous traditional knowledge and intellectual property rights' *Policy Commons* (2004).

Thairu W 'A Critical Analysis of the Impact of Digitizing Indigenous Knowledge' *East African Journal of Information Sciences* 1(1) (2007) 51–73.

UN Department of Economic and Social Affairs 'Sustainable Development Goal 4' (2022) <https://sdgs.un.org/goals/goal4>.

UN General Assembly: 'Universal Declaration of Human Rights' (Resolution 217A, adopted 10 December 1948) <https://www.un.org/en/about-us/universal-declaration-of-human-rights#:~:text=Article%2027,scientific%20advancement%20and%20its%20benefits>.

UN: 'The Permanent Mission of the Republic Kenya to the United Nations' <https://www.un.int/kenya/about>.

UNESCO Education Sector: 'Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development' *Working Papers on Education Policy No 7* (2019) <https://unesdoc.unesco.org/ark:/48223/pf0000366994>.

UPOV: PLUTO Plant Variety Database. UPOV <https://www.upov.int/pluto/en/>.

Vesper I 'Indigenous People Need Control Over Digital Tech' *SciDevNet* (2016) <https://www.scidev.net/global/news/indigenous-peopl-control-digital-tech/>.

Wheeler HC, Danielsen F, Fidel M, Hausner V, Horstkotte T, Johnson N, Lee O, Mukherjee N, Amos A, Ashthorn H, Ballari O, Behe C, Breton-Honeyman K, Retter GN, Buschman V, Jakobsen P, Johnson F, Lyberth B, Parrott JA, Pogodaev M, Sulyandziga R and Vronski N 'The need for transformative changes in the use of Indigenous knowledge along with science for environmental decision-making in the Arctic' *People and Nature* 2(3) (2020) 544 <DOI: 10.1002/pan3.10131>.

WIPO: 'Inventory of Existing Online Databases Containing Traditional Knowledge Documentation' Data World Intellectual Property Organization <https://www.wipo.int/ meetings/en/doc_details.jsp?doc_id=2166>.

WIPO: Traditional Knowledge <https://www.wipo.int/tk/en/tk/>.

Yale Law School Information Society Project: 'Access to Knowledge' <https://law.yale.edu/isp/about/initiatives/access-knowledge>.

Chapter 10

Labour law as a technology for humanising work in the digital era[1]

10.1 Introduction

In *Responsible AI in Africa*,[2] the authors document the landscape, and the opportunities and challenges, for the deployment (and governance) of artificial intelligence (AI) in Africa and provide insight on achieving responsible AI, resting on three pillars: 'the willingness of stakeholders to accept responsibility for the impact of AI, the development of mechanisms that can enable AI systems to be sensitive to ethics and human values and appreciation of different impacts of AI in different contexts.'[3] In this regard labour law, as a tool for governance and regulation, is an important mechanism to facilitate the ethical deployment of AI and for the protection of human values in the world of work.[4]

In Africa, emerging technologies and AI are deployed in a number of industries including financial services, healthcare, education, transportation, agriculture, public services, security, business management and telecommunications.[5] AI systems[6] in the

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1 I am most grateful to Professor Tobias Schonwetter and Professor Rochelle le Roux for their insightful feedback on an earlier version of this chapter, and to the anonymous reviewers for their critical analysis and comments. I would also like to thank Professor Laura Foster for the many great discussions we have had on technology and the law, and which have shaped my perspectives in this regard. On law as a technology, see Biagioli M and Buning M 'Technologies of the law/law as a technology' at 3. The authors explore, albeit in the context of IP law, the idea of law as a political technology, constructed to function as an instrument that balances rights and interests; and the technologies of the law being the mechanics (the 'practices and sites') through which the law construes its object.

2 Eke DO, Wakunuma K, and Akintoye S (eds) *Responsible AI in Africa: Challenges and Opportunities*. For a roadmap on achieving responsible AI in Africa see at 186.

3 Eke DO, Chintu SS and Wakunuma K 'Towards Shaping the Future of Responsible AI in Africa' at 180–811.

4 Labour laws on the African continent are influenced by international labour standards and member states' commitments to the International Labour Organisation (ILO). At the continental level, the African Union (AU) African Charter on Human and Peoples' Rights, 1981 affirms the fundamental principles and the right to equitable and satisfactory conditions of work, and regional instruments, such as the Southern African Development Community (SADC) Protocol on Employment and Labour, 2014 (likely to be amended in 2023) flesh out these commitments and promote decent work in the region.

5 Eke, Chintu and Wakunuma at 172. See also AUDA-NEPAD: *AI for Africa: Artificial Intelligence for Africa's Socio-Economic Development* at 19–25, which presents a number of case studies, including drones for mining, AI systems for business activities in agriculture, and innovative applications in manufacturing and health, that assist with diagnostic prediction and imaging diagnosis, among other uses. Case studies in the energy, finance and education sectors and in public-service delivery are also provided.

world of work range from software-based systems involved in recruitment and human resource (HR) processes, algorithms that allocate work (including work in the gig economy), and determine who is hired, promoted, and retained, to AI robotics, such as robots that assist in mining and manufacturing processes, self-driving vehicles,[7] and drones, as well as the many applications of AI and robotics in the healthcare industry, including humanoid robots assisting with patient care, and AI applications in robotic surgery.[8]

New technologies are disrupting and transforming the world of work: new forms of work and work arrangements are emerging, including remote work and platform work in the gig economy.[9] The modern world of work is increasingly characterised by non-standard forms of work,[10] and declining trade union density.[11] For many workers, work is performed outside of the employers' premises, and outside of labour law's net of protection.[12] Hence, to remain relevant and effective labour law, which itself is a technology for protecting labour standards and balancing rights and interests in the labour market, needs to evolve, and to adapt to the changing dynamics of the workforce, and its boundaries must be adjusted to ensure the effective protection of core labour standards.[13] The view in AUDA-NEPAD's report *AI for Africa: Artificial Intelligence for Africa's*

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6 AI systems have been defined as 'systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals'. European Commission, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: 'Artificial Intelligence for Europe' at 1.

7 Self-driving vehicles may perform numerous functions, such as delivery robots, as well as 'unmanned agricultural vehicle[s] that can mechanically remove weeds'. European Commission: 'Artificial Intelligence for Europe' at 5.

8 See Wehde M 'Healthcare 4.0' at 24. See also Baijnath M, Butcher N and Wilson-Strydom M *Artificial Intelligence in Sub-Saharan Africa: Compendium* where the authors identify the complexities and challenges to the adoption of AI technologies in numerous countries on the African continent.

9 Remote work, involving the performance of work outside of an employer's premises, is facilitated by digital technologies and AI. As a form of remote work, platform or gig work is enabled by digital infrastructure and AI systems that serve as intermediaries connecting workers with clients via online platforms or mobile apps.

10 Moreover, in developing countries, and in most African countries, work in the informal economy is prevalent. For an analysis of the statistics and trends see ILO: *Women and men in the informal economy: a statistical picture*.

11 For statistics (the percentages reflected are estimates based on various sources) on union membership see ILO: 'Statistics of Trade Union Membership'. The statistics that are available suggest that most countries have experience a decline over the past decades (e.g., in Zambia from 38% in 2010 to 27.6% in 2020; in Ghana from 48.5% in 2008 to 38.4% in 2020; in Ethiopia from 9.8% in 2013 to 1% in 2019), although some countries have experienced an increase (e.g., Tunisia from 54.9% in 2010 to 62.9% in 2019; Uganda from 15.1% in 2016 to 30.2% in 2019). Union membership levels are relatively low in most African countries, which is a barrier to effectively organising workers.

12 The effectiveness of trade unions and the ability to organise workers is constrained by developments in which work is restructured, fragmented, and distributed across value chains, often regional and global in scope. See Flecker J 'Outsourcing, Spatial Relocation and the Fragmentation of Employment' at 251.

13 See Rainone S 'Digital and Remote Work: Pushing EU Labour Law beyond Its Limits'. The labour law systems in Africa have been influenced and shaped by international labour standards and the systems of former colonial powers and share similar norms.

Socio-Economic Development is that 'the world of work is going through the most encompassing transition that it had had to face in the past 200 years. . . . [and] the serious implication of this transition is that Africans must forget about "jobs" and instead focus on "work".'[14] This has implications for workers and for labour law, as the traditional scope of labour law is the protection of labour standards for workers who have a job in an employment relationship and does not extend to other forms of work. As workers shift from jobs to work, unless the boundaries of labour law are redrawn, less workers will be protected by the law, and the law itself will become redundant.

While the deployment of AI technologies holds the promise of significant benefits and opportunities for human development, it also presents challenges and risks. In the world of work, these risks include fears of large-scale job losses,[15] and concerns that workers will find themselves subject to invasive technological monitoring and supervision and exposed to an increased risk of bias and discrimination. In the next part of the chapter, the role, underlying values, and boundaries of labour law are considered, and the need for labour law to redefine its scope is elaborated on.[16] This is followed by sections on concerns regarding job losses, the impact of AI systems on the protection of privacy, and the risk of bias in AI systems. The final section of the chapter considers the need to reaffirm and revitalise workers' collective rights. The chapter concludes with practical recommendations on the future of labour law, and the role of labour law as a technology for humanising work in the digital era.

10.2 Revisiting the role, values, and boundaries of labour law

Labour laws regulate labour standards and facilitate collective bargaining and the exercise of managerial powers in a relationship between workers and their employers.[17] The labour standards and related principles established by labour law have a fundamental human rights foundation,[18] which is integral to the humanisation of

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14 AUDA-NEPAD: *AI for Africa* at 50. The report goes on to indicate that AI technologies and related developments bring 'significant disruptions at all levels' and that 'workers . . . must have the capacity to deal with the AI resultant disruptions and manage to constantly adapt to the changing circumstances and demands with respect to time-and-progress sensitive skill sets'.

15 Although earlier predictions on the extent of job losses have come under scrutiny, and the predictions of massive unemployment 'tend to focus exclusively on *technical feasibility*, with no account of social, legal, political, or organizational factors'. See Moradi P and Levy K 'The Future of Work in the Age of AI: Displacement or Risk-Shifting?' at 275.

16 Although the chapter refers primarily to labour law in the South African context, the core principles and the primary features considered in the chapter are common in many labour law systems and are relevant for the development of labour law in Africa.

17 Clause 2 of the ILO Declaration on Fundamental Principles and Rights at Work, 1998, as amended in 2022, obliges all ILO members, including the countries in Africa, to respect, promote and realise the principles concerning the following fundamental rights: '(a) freedom of association and the effective recognition of the right to collective bargaining; (b) the elimination of all forms of forced or compulsory labour; (c) the effective abolition of child labour; (d) the elimination of discrimination in respect of employment and occupation; and (e) a safe and healthy working environment.'

18 Relevant fundamental human rights include protection from forced labour and slavery, protection from discrimination, freedom of association and the right of peaceful assembly, as well as freedom of expression and the right to privacy.

work.[19] Moreover, labour law[20] functions as a 'countervailing force' to balance the unequal bargaining power in the employment relationship,[21] and as a politically negotiated instrument for balancing the interests of labour and capital in the labour market.

The regulatory systems that constitute labour law are constructed dynamically, and require development, revision and adaptation as the law interacts with technological advancements, among other social and economic forces, including globalisation, regional integration, and increasingly, events related to climate change and the need to transition to a low carbon economy, all of which impact on employment,[22] working arrangements,[23] and how work is performed.[24] As such, 'the issues resulting from integrating AI with work are not wholly new, but are instead the continuation of a long line of labour concerns that have endured and transformed throughout the history of industrialized work'.[25]

The complexities of industrialised work (sometimes traced on a timeline of four industrial revolutions),[26] and the concerns of labour are particularly salient in the context

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19 See Andreeva A and Yolova G 'On Humanizing Work in the Digital Age' at 178.

20 Some jurisdictions differentiate between employment law (regulating the rights of individual employees) and labour law (concerned with collective relationships such as between trade unions and employers). In South Africa the term labour law is used broadly to encompass both individual and collective dimensions of work and includes protection from discrimination at work. Social-security law is a distinct but related field of law.

21 Otto Kahn-Freund's articulation of the purpose of labour law is discussed in the context of apartheid South Africa in Davis D 'The functions of labour law' at 212.

22 See Moradi and Levy at 271; and De Stefano V '"Negotiating the Algorithm": Automation, Artificial Intelligence, and Labour Protection' 2019 at 15.

23 Technological innovation is creating new, virtual, marketplaces – digital platforms – around which 'a "huge array" of services and products are offered in return for payment or otherwise'. See Du Toit D 'Platform Work and Social Justice' at 1.

24 Fredman et al. reflect on how work is performed in the gig economy and argue that 'not enough attention has been paid to how labour law standards, fashioned for the "employee" paradigm, should be shaped to meet the needs of platform workers regardless of their employment status.' See Fredman S, Du Toit D, Graham M et al. 'Thinking Out of the Box: Fair Work for Platform Workers' at 236 (Fredman et al.).

25 Moradi and Levy at 287.

26 In describing industrial work, some economic historians identify four industrial revolutions (first, from agriculture to steam-powered industrialisation; the second linked to the production of electricity and combustion engines; the third to advances in computing and communications; and the fourth industrial revolution (4IR) to advanced technologies such as AI, big data, robotics, and the internet of thing. However, this approach remains contested, and furthermore originated to describe industrial developments largely taking place in the UK, Europe and North America. In this regard, see Sutherland E 'The Fourth Industrial Revolution – The Case of South Africa' at 233. Sutherland dismisses '4IR' as 'a rhetorical device' and instead argues for a more targeted approach to the regulation of AI as a general-purpose technology (GPT) as opposed to a more general approach to regulating 4IR technologies/ technological advancements more broadly. In this regard, The OECD: *Recommendations on Artificial Intelligence (AI)* provides an example of a GPT framework, whereas in South Africa, the 4IR 'rhetorical device' approach is reflected in a report of the Presidential Commission on the 4th Industrial Revolution (PC4IR), although the PC4IR does propose the establishment of an AI institute that 'will be responsible for the country's computer vision and [will] deal with arising ethical issues'. See *Summary Report & Recommendations* (*GG* 43834, 23 October 2020) at 305.

of African countries where the path of industrialisation has been influenced by colonial powers that carved up the African continent, 'each overseeing extraction of resources in different areas'.[27] While this has influenced the development trajectories of countries on the continent, in the current context of emerging technologies and AI, caution is raised against 'the algorithmic colonization of Africa . . . [which] may echo colonialism by neglecting local interests and disadvantaging minority groups'.[28]

The AUDA-NEPAD report urges policymakers, at national, regional and continental levels, to determine the 'priorities and directions of AI' and 'to formulate policies and regulatory frameworks that best suit the Africa context' and to 'clear the way for innovation [. . . and to] restrain harm from the adoption of AI technologies[29] and support human rights, safety, and privacy'.[30] Considerations in this regard should include the impact of the deployment of AI on the world of work, which gives rise to new forms of atypical work,[31] and contributes to processes of casualisation,[32] externalisation,[33] and informalisation.[34]

Whereas an employee in standard employment benefits from the fullest extent of labour standards, including constraints on managerial prerogative, this is not the case for workers who fall outside of the net of protection,[35] including workers in the platform

27 Sutherland at 236.

28 Birhane A 'Algorithmic Colonization of Africa', cited in Eke, Wakunuma and Akintoye at vi.

29 Guidance on the ethical deployment of AI is provided by the OECD: *Recommendation on AI*, which reinforces the importance of 'human-centred values and fairness' (incorporating respect for internationally recognised labour rights) as one of five 'complementary values-based principles' for AI. The remaining four principles are 'transparency and explainability'; 'accountability'; 'robustness, security and safety'; and the pursuit of 'inclusive growth, sustainable development and well-being'. The requirement for security and safety entails 'a systematic risk management approach . . . to address risks related to AI systems, including privacy, digital security, safety and bias'. See OECD: *Recommendations on AI* 1.4(a).

30 AUDA-NEPAD: *AI for Africa* at 2.

31 With limited exceptions, workers who are in non-standard employment, and even more so, workers who are independent contractors, self-employed or who are own-account workers, fall outside the net of employment protection. E.g., although the Constitution of the Republic of South Africa, 1996 (Constitution) s 23(1) provides for the right of *everyone* to fair labour practices, the scope of application of statutory labour protection and rights is limited by the Labour Relations Act 66 of 1995 (LRA), the Basic Conditions of Employment Act 75 of 1997 (BCEA), and the Employment Equity Act 55 of 1998 (EEA), among others, that apply to employees and expressly exclude independent contractors. 'Workers' have limited rights in terms of the National Minimum Wage Act 9 of 2018.

32 Casual work is precarious work and is part-time and/or temporary in nature, or work that can be described as occasional or intermittent. Casual-work arrangements can be exacerbated by the deployment of technologies, e.g. through 'staffing algorithms . . . [that] predict customer demand and associated staffing levels . . . [resulting in] a variety of "just-in-time" scheduling practices that introduce significant precarity and instability into the lives of low-wage workers'. See Moradi and Levy at 279.

33 Work is externalised when employment is replaced by other forms of commercial arrangements, including the engagement of workers as contractors, as well as the engagement of work through a service provider, or other intermediary.

34 Workers in the informal economy are inadequately protected by regulation, and the process of informalisation occurs when workers are forced out of formal employment, often as a result of casualisation and externalisation.

35 As De Stefano explains at 40, '[w]idespread recourse to temporary and casual work arrangements, which do not require a reason of termination for the work to be discontinued,

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economy.[36] In most labour law systems, 'the precondition for a party to establish the existence of a contractual relationship [of employment] between that party and any putative employer'[37] constitutes a barrier for atypical workers, such as platform workers, seeking labour protection. As Fredman et al. observe 'platforms are adept at reconfiguring their conditions of work to avoid the legal definition of employee'.[38] Consequently, innovative regulatory strategies for the design and implementation of labour standards for workers have emerged, such as the Fairwork project in relation to platform workers, and which could be pursued as a pathway to decent work,[39] with a view ultimately to inform statutory developments in which 'these principles [are generalised] in the form of binding legal standards'.[40]

De Stefano argues for the revision of the boundaries of labour law and that 'human rights approaches . . . justify a universal approach aimed at extending labour protections beyond the traditional scope of the employment relationship',[41] which could require modifications to 'worker classification regimes' or amendments to regulations that exclude categories of workers from its protection.[42] In recent developments in South Africa, the Presidential Commission report on the 4IR in South Africa recommends the amendment of 'labour legislation to accommodate the Gig economy by recognising Internet project work as legitimate work',[43] and in a subsequent development, the Employment Services Amendment Bill [B 2021][44] proposes the inclusion of definitions

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magnify managerial prerogatives and aggravate the risk of abuses, as workers will be reluctant to resist invasive supervision practices lest their work arrangement not be renewed or be zeroed-down'.

36 Platform work is 'characterised by an absence of effective labour regulation'. See Du Toit D, Fredman S and Graham M 'Towards Legal Regulation of Platform Work: Theory and Practice' at 1493.

37 *Uber SA Technology Services (Pty) Ltd v National Union of Public Service & Allied Workers (NUPSAW) & others* [2018] 4 BLLR 399 (LC) para 71.

38 Fredman et al. at 236.

39 The Fairwork regulatory strategy relates to platform work, with five core principles (Fair Pay; Fair Conditions; Fair Contracts; Fair Management; and Fair Representation) having been developed to inform the Fairwork public ranking system, which was designed in consultation with stakeholders and in workshops at the ILO. See Fairwork: 'Principles'.

40 Fredman et al. at 249.

41 De Stefano at 40.

42 Moradi and Levy at 286. See also Fredman et al. at 236.

43 PC4IR: *Summary Report & Recommendations* at 321, however the report does not elaborate on the proposed amendments, yet it suggests that such amendments 'should include incentives for companies to build Gig Economy platforms to leverage South African 4IR skills for global demand'. Any developments in this regard should be negotiated with stakeholders and must emphasise labour protections and human development.

44 The Amendment Bill was published for comment in *Government Gazette* 45962 of 28 February 2022. In terms of clause 1 of the Bill, '"digital labour platform" means an electronic entity that enables the provision of work or services by a person to any other person in the Republic'; an '"employer" means any person who remunerates, or is liable to remunerate, an employee or a worker'; '"employment" means employment as an employee or as a worker;' and '"worker" means any person who works for another and who receives, or is entitled to receive, any payment for that work, whether in money or in kind'. Clause 3 of the Amendment Bill provides that 'a digital labour platform is an employer and any person who provides work or services in the Republic to another person by means of a digital labour

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for a 'digital labour platform' and a 'worker', and conditions that would determine if the digital platform is the employer, albeit in the limited circumstances of the Employment Services Act.[45]

Concerns have also been raised regarding the implications of ascribing legal status (in some cases even 'citizenship')[46] to AI systems, and the potential for managerial decision-making by AI to contribute to a dehumanising dynamic in the world of work. As De Stefano explains, '[a]ssigning electronic personality to robots and AI-tools could . . . allow their owners and producers to shed responsibility and could leave other parties, including commercial partners, creditors, customers, and workers that interact with these devices, exposed to the risk of having no meaningful redress in case of damage'.[47] In response, a human-in-command approach is widely advocated,[48] in which, regardless of whether electronic personality is introduced, 'machines maintain the legal status of tools, and legal persons retain control over, and responsibility for, these machines *at all times*',[49] and 'any managerial decision suggested by AI [should] be subject to review by human beings who remain legally accountable, together with their organization, for the decision and its outcomes'.[50] AI systems must be transparent,[51] and must be subject to the rules and principles that would otherwise apply to humans.[52]

In the context of labour law as a politically negotiated instrument for balancing the interests of labour and capital in the labour market, high levels of inequality and the digital divide on the continent are factors that should not be overlooked.[53] In this regard, the authors in *Digital Futures: South Africa's Readiness for the Fourth Industrial*

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platform is a worker if – (a) the payment for, or terms and conditions of, such work or services are determined by (sic) digital labour platform; and (b) the digital labour platform remunerates the worker'.

45 Act 4 of 2014 (ESA). The purpose of the ESA is to promote employment and to provide opportunities for work seekers and employees facing retrenchments, which is to be achieved by establishing schemes and other measures to promote employment, and to provide a regulatory framework for private employment agencies.

46 E.g., Saudi Arabia awarded citizenship to 'Sophia,' a humanoid robot in 2017. See Wikipedia: Sophia_(robot).

47 De Stefano at 19–20.

48 UNI Global Union: *10 Principles for Ethical Artificial Intelligence* Principle 4; ILO Global Commission on the Future of Work: *Work for a brighter future*; and see generally the sources cited in De Stefano at 44–45.

49 UNI Global Union: *10 Principles for Ethical Artificial Intelligence* Principle 4.

50 De Stefano at 44.

51 Similarly, Principle 1 of the UNI Global Union: *10 Principles for Ethical Artificial Intelligence* requires AI systems that are transparent, meaning that 'it is possible to discover how, and why, the system made a decision, or in the case of a robot, acted the way it did'. Moreover, transparency in the workplace requires that workers have 'the right to appeal decisions made by AI/algorithms and the right to review by a human'; and to be 'consulted on AI systems implementation development and deployment'.

52 UNI Global Union: *10 Principles for Ethical Artificial Intelligence* Principle 4 includes a provision that 'AI systems should be designed and operated to comply with existing law, including privacy'.

53 See, e.g., World Bank: *Inequality in Southern Africa: An Assessment of the Southern African Customs Union*; Mignamissi D 'Digital Divide and Financial Development in Africa' Telecommunications Policy 45.9.

Revolution warn that 'the unevenness of digital development in South Africa will intensify in the absence of policy interventions that redress the underlying structural inequalities in the economy and society'.[54] The report thus advocates for an 'emphasis on human development . . . aimed at reducing inequality, and enabling the exercise of peoples' rights online, in order to achieve greater social and economic inclusion';[55] similarly the Presidential Commission on the 4th Industrial Revolution[56] endorses a human-centred approach, aligning with the approach adopted by the Global Commission on the Future of Work.[57]

As AI technologies continue to shape the world of work, from the recruitment of workers to the termination of their working arrangements,[58] the ethical and sustainable use of AI must be negotiated at all levels through 'social dialogue, to ensure a fair transition for workers as AI is deployed'.[59] Social dialogue is an important governance mechanism, which plays a critical role in times of 'economic and jobs crisis and acceleration of change and reforms . . . [in] promoting crisis recovery and facilitating adaptation to change'.[60]

Labour laws remain relevant in the digital era. However, new technologies present challenges and complexities requiring labour law to adapt. Social dialogue is critical in this regard, and it is the role of policymakers at all levels, and governments and social partners at national level to ensure that labour laws are 'fit for purpose' and are responsive to the challenges workers' face in a rapidly changing world of work. Labour standards should extend to workers in non-standard work arrangements, such as work in the platform economy, while ensuring equitable access to social protection, and opportunities for retraining and upskilling, which is increasingly important for workers

54 Research ICT Africa: *Digital Futures: South Africa's Readiness for the 'Fourth Industrial Revolution'* at 2.

55 Ibid. at 2–3.

56 PC4IR: *Summary Report & Recommendations*.

57 ILO Global Commission on the Future of Work: *Work for a brighter future* at 11 proposes '*a human-centred agenda for the future of work* that strengthens the social contract by placing people and the work they do at the centre of economic and social policy and business practice'. This agenda involves 'three pillars of action', being (1) increased investment in developing human capabilities; (2) increasing investment in the institutions of work; and (3) increasing investment in decent and sustainable work.

58 See Tambe P, Cappelli P and Yakubovich V 'Artificial Intelligence in Human Resources Management: Challenges and a Path Forward' at 15.

59 OECD: *Recommendations on AI* 2.4. This is affirmed in the UNESCO: Outcome Statement of the Forum on Artificial Intelligence in Africa, which urges 'African governments to engage in a constructive dialogue with all national, regional and international partners on . . . integrat[ing] AI into national policies and strategies, as a vector for the emergence of African economies based on African cultures, values and knowledge'. In the world of work, social dialogue occurs at different levels and entails a range of processes and practices, including the exchange of information, consultation, and negotiation.

60 ILO: *National tripartite social dialogue: an ILO guide for improved governance* at xii. Social dialogue can occur at different levels and take different forms. Tripartite social dialogue involves government and the social partners (employers' and workers' organisations) – in South Africa the national social dialogue institute (NEDLAC) is established and regulated by the National Economic Development and Labour Council Act 34 of 1994. Bipartite social dialogue involves the social partners, without direct government intervention (although government may assist and oversee compliance with any applicable regulatory system for social dialogue). Collective bargaining is an example of the latter.

whose jobs are displaced, as the nature of work and the labour market undergoes rapid changes, not only as a result of advanced technologies but also as countries, industries and communities adjust to climate change adaptations and the demands of a just transition.[61] In the next section, the role of labour law as a tool for humanising the world of work in responding to concerns regarding the displacement of jobs is considered.

10.3 Responding to the potential displacement of jobs

Much of the debate on the deployment of AI in the world of work centres on concerns that automation and AI-driven technologies (so-called '4IR' technologies) will result in high levels of job losses,[62] and the potential for large-scale redundancies based on operational requirements.[63] In many countries, for workers who are in a formal employment relationship, a regulatory framework is in place, aimed at ensuring the fairness of so-called 'no-fault' termination of employment for 'reasons of an economic, technological, structural or similar nature'.[64] Importantly, as soon as retrenchment is contemplated, an employer must share the relevant information[65] and engage with workers or their representatives when required to do so.[66] Where appropriate, it should be possible for public bodies to be involved before a large-scale dismissal takes effect.[67] The process concerned is one of social dialogue, involving a consultation in which

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61 The UNESCO: Outcome Statement of the Forum on Artificial Intelligence in Africa notes 'the scope of the environmental challenges and threats to peace that affect some regions on the Africa Continent, leading among other things, to massive population displacement and youth migration'.

62 This is a concern for developing countries that have an abundance of low-skilled workers. See Sutherland at 245. More generally, see Frey C and Osborne M 'The future of employment: how susceptible are jobs to computerisation?' See also the World Economic Forum: 'The Future of Jobs Report'; Choi J, Dutz M and Usman Z (eds) *The Future of Work in Africa: Harnessing the Potential of Digital Technologies for All*.

63 The PC4IR: *Summary Report & Recommendations* at 278 indicates that '[w]ork that has a high potential to be automated includes physical manual labour, machine operations and manoeuvring, technical equipment maintenance, processes and analytics . . . [and that] workers in the lower to middle levels will be more likely to be the first affected. About 60% of the labour force in South Africa occupies roles consisting largely of automatable tasks.'

64 ILO Termination of Employment Convention 1982 (No. 158) Art 13. In the South African context, see ss 189 and 189A of the LRA and the Code of Good Practice on Dismissal based on Operational Requirements. The Code of Good Practice, item 1 refers to technological reasons as 'the introduction of new technology which effects work relationships either by making existing jobs redundant or by requiring employees to adapt to the new technology or a consequential restructuring of the workplace.' For a comprehensive overview of the law in South Africa, see Le Roux R *Retrenchment Law in South Africa*.

65 This includes 'the reasons for the terminations contemplated, the number and categories of workers likely to be affected and the period over which the terminations are intended to be carried out'. ILO Convention No. 158 Art 13(1)(a).

66 Generally, the process involves consultation and information sharing with a view to finding measures to minimise the impact of the dismissals. In South Africa, the engagement involves 'a joint problem-solving exercise to strive for consensus if that is possible'. See the Code of Good Practice Item 3.

67 The process involves consultation and information sharing with a view to finding measures to minimise the impact of the dismissals. See also ILO Termination of Employment Recommendation, 1982 (No. 166).

> '[a]ll parties concerned should seek to avert or minimise as far as possible termination of employment for reasons of an economic, technological, structural or similar nature, without prejudice to the efficient operation of the undertaking, establishment or service, and to mitigate the adverse effects of any termination of employment for these reasons on the worker or workers concerned'.[68]

Nonetheless, even with termination laws in place, the concern is that '[j]ob losses could occur at levels unheard of in the past, for instance, or new technologies could be introduced at a pace that strains current regulation and industrial relations'.[69] With tensions heightened in a post-pandemic context, and in a country like South Africa with dangerously high levels of unemployment and racial inequality,[70] it is crucial that regulators and social partners take every opportunity to engage on the impact of AI technologies in the world of work and explore ways to mitigate potential disruptions that may occur as a result. Social dialogue, and the early involvement of workers' representatives in the process is vital for minimising the negative impact on workers. Measures should be adopted to ensure effective 'training programmes along the working life, and tailored social protection measures, and related support for those affected by displacement, and access to new opportunities in the labour market',[71] on which the PC4IR elaborates in its recommendations for South Africa.[72]

For workers who remain employed, or who are engaged in new forms of work, there is a concern that the deployment of AI systems, and the integration of AI technologies in supervision and managerial practices[73] ('management-by-algorithm') could

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68 ILO Termination of Employment Recommendation No. 166 Recommendation 19(1).

69 De Stefano at 42.

70 South Africa forms part of the Southern African Customs Union (SACU), reportedly the most unequal region in the world. Sulla V, Zikhali P and Cuevas F *Inequality in Southern Africa: An assessment of the Southern African Customs Union* at 1. The World Bank report indicates that labour markets in the SACU region are characterised by high unemployment and that 'per capita, South Africa, the largest country in SACU, is the most unequal country in the world' and that levels of unemployment are high in the region. According to the Quarterly Labour Force Survey (QLFS) released by Statistics South Africa for the first quarter of 2022, the unemployment rate is South Africa is 34.5%.

71 OECD: *Recommendations on AI* 2.4. Similarly, Principle 7 of the UNI Global Union: *10 Principles for Ethical Artificial Intelligence* requires that workers have access to retraining and lifelong learning opportunities, and access to social security, to ensure a just transition to the digital economy and to promote sustainable development.

72 PC4IR: *Summary Report & Recommendations* at 321–323. Specifically, the PC4IR recommends 'in light of recent retrenchments due to adoption of 4IR technologies . . . that government considers incentive package for companies that upskill their workforce for the era for IR and beyond', as well as the ring-fencing of Unemployment Insurance Funds (UIF) for upgrading the skills of unemployed persons: *Summary Report & Recommendations* at 323. Importantly though, at 36 De Stefano cautions against social protection measures, such as a Universal Basic Income, being used as a justification for rolling back employment protection and labour standards and points out that '[t]he idea of replacing labour protections at the workplace with securing the stability of income neglects fundamental aspects of the employment relationship, which warrant regulatory limits aimed at protecting human dignity at the workplace'.

73 Managerial practices relate to the prerogative to assign tasks and to monitor performance and discipline employees, within the constraints of labour law if it applies to the working arrangements.

'lead to very severe intrusions into workers private life and materially infringe on their privacy'.[74]

10.4 Prioritising privacy in an era of big data and technological monitoring

Data, including data about us and obtained in the context of work,[75] is 'the new gold', the 'building blocks of artificial intelligence and algorithms', and 'the very foundation of the myriad of new businesses and services that are increasingly individualizing many aspects of our economy and society, namely the platforms of the so-called gig economy'.[76] AI systems are capable of collecting, and processing, vast amounts of data from an array of sources, and 'allow for the monitoring of workers activities to an extent unthinkable in the past as well as the gathering and processing of an enormous amount of data on these activities'.[77] Adverse decisions can be taken against workers as a result,[78] and technology-enhanced analysis of activities may inform managerial decisions and enable firms to reallocate risks from the firm to workers.[79] Consequently, safeguarding the rights and interests of workers requires the effective implementation of the right to privacy, and robust and dynamic data protection principles, as well as a supportive framework for the governance of employee data negotiated collectively at workplace or sector level.[80]

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74 De Stefano at 27.

75 '[W]e daily leave a data trail behind us: from what we search for on Google to the apps on our mobile phones, from rides we take in taxis, flats we rent, from what we buy, to our loyalty cards, our health records, phone calls to customer services. Not to mention the places we visit, emails we send, Facebook friends we have and tweets we write.' See UNI Global Union: *Top 10 Principles for Workers' Data Privacy and Protection* Principle 4.

76 Ibid.

77 De Stefano at 23.

78 De Stefano explains at 24 how GPS systems allow for monitoring of workers such as truck drivers, delivery riders and ride-sharing drivers who work for on-demand platforms, which influences the assignment of tasks. Platform algorithms measure workers' performance but also factor in customer rating and reviews; and that '[b]ad scores or performance below the algorithms standards can lead to the exclusion of the worker from the platform and thus to "dismissal," also made easier by the purported self-employment status of these workers.' Similarly, the performance of Amazon workers is both guided and measured by technological tools, which enables Amazon to track the efficiency of each worker, with 'underperforming' workers at risk for being warned or terminated.

79 Moradi and Levy at 279–280 explain the mechanisms such as algorithmic staffing/scheduling that result in 'just-in-time' scheduling, and technologies that redefine compensable work and compensate workers for specific tasks only, minimising the labour cost to firms and shifting the burden to workers.

80 At 41 De Stefano underscores the importance of collective rights and the right to collective bargaining as a 'mechanism to provide adequate and specific standards in the context of data collection and processing to safeguard the human dignity and the fundamental rights of workers'. See also Principle 10 of the UNI Global Union: *Principles for Workers' Data Privacy and Protection,* which highlights the desirability of data principles being implemented and enforced through workplace ('company') or sectoral level collective bargaining.

The right to privacy is a fundamental human right,[81] which includes 'protection against the unlawful collection, retention, dissemination and use of personal information'.[82] Limitations are justified only if they are 'aimed at protecting other rights and important interests', including 'the need for economic and social progress'.[83] This is recognised in South Africa in the POPIA, the purpose of which is to 'regulate, in harmony with international standards, the processing of personal information by public and private bodies in a manner that gives effect to the right to privacy'.[84]

Crucially, privacy and data protection rules must be capable of protecting workers against excessive surveillance and 'abusive supervision practices in the wake of the spread of technology enhanced monitoring systems'.[85] In this regard, Hendrickx points out that privacy and data protection principles have developed alongside technological advancements, and he traces the stages of law's development, from Privacy 1.0 to Privacy 4.0, with Privacy 4.0 being concerned with the threat to privacy and workers' rights posed by AI, algorithmic decision-making and advanced robotics (Industry 4.0 technologies). Hendrickx explains that privacy 1.0 confirmed the right to privacy and its application to everyone, including workers, and the requirement that any limitation to privacy must be justified and proportionate. Furthermore, the principle of legality requires transparency, and that 'any interference with the employee's right to privacy should be in accordance with a clear and accessible (predefined or established) norm'.[86] Technological developments from the 1980s necessitated a focus on the processing of personal data, and the development of privacy principles in the context of data protection. This was the shift to privacy 2.0, with the emergence of laws and principles governing the data processing of personal information, including the concept of technological neutrality requiring the application of privacy and data-protection principles regardless of the technology used and whether or not data processing is automated.[87] In this context, legitimacy requires a lawful justification for processing data, which includes 'compliance with a legal obligation' but also includes 'where employers have a contractual or other legitimate interest'.[88] Data processing must 'remain proportionate to the legitimate purposes', limiting the data collected and processed.[89] Data processing must also be transparent, ensuring that workers are 'informed about whether personal data regarding him or her are being collected and the identity of the . . . [collector], the purposes, whether data are being transferred to recipients, and so on.'[90] In addition, 'the right to access and rectification of personal data' is required.[91]

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81 The Constitution s 14 protects privacy, 'which includes the right not to have – (a) their person or home searched; (b) their property searched; (c) their possessions seized; or (d) the privacy of their communications infringed'.

82 Protection of Personal Information Act 4 of 2013(POPIA) Preamble.

83 The POPIA Preamble provides that 'consonant with the constitutional values of democracy and openness, the need for economic and social progress, within the framework of the information society, requires the removal of unnecessary impediments to the free flow of information, including personal information'.

84 Preamble.

85 De Stefano at 39.

86 Hendrickx F 'Privacy 4.0 at Work: Regulating Employment, Technology, and Automation' at 156.

87 Ibid. at 158. In the South African context, see the provisions in POPIA.

88 Ibid. at 159.

89 Ibid. at 160.

90 Ibid. at 161.

91 Ibid.

The development of the internet and networked technologies since the 1990s have increased the possibilities for monitoring and surveillance, turning 'the modern workplace into a potential major control place' and resulting in privacy racketing up to the next level: 'Privacy 3.0'.[92] This necessitated a focus on *fairness* to address the 'imbalance of informational power and control' which, 'in the employment context . . . [entails] a power shift between employers and workers due to a new electronic monitoring environment'.[93] Fairness requires the elaboration of principles for electronic monitoring, and procedures to ensure transparency and to guard against the abuse of power.

Finally, as technology has become more intelligent – related to AI and algorithmic decision-making – the principles of privacy have shifted up a level, to privacy 4.0, which entails 'a humanization agenda and a human-in-command approach'[94] as a bulwark against the 'new elements of dehumanization', as workers increasingly interact with AI-driven technological devices, with a corresponding decline in the role of human supervisors in managing the workforce.[95]

Privacy 4.0 is concerned with data processing that results in profiling and automated decision-making and elaborates on: the right to object; the right to be informed about automated decision-making; and the right to a human interface – a human-in-command approach in which workers, at both an individual and a collective level – are afforded the opportunity to challenge automated decision-making. In South Africa, POPIA[96] goes some way towards regulating *automated decision making* and provides that

> 'a data subject may not be subject to a decision which results in legal consequences for him, her or it, or which affects him, her or it to a substantial degree, which is based solely on the basis of the automated processing of personal information intended to provide a profile of such person including his or her performance at work, or his, her or its credit worthiness, reliability, location, health, personal preferences or conduct'.[97]

It is of course not difficult to imagine how data processing and the deployment of AI technologies may result in discriminatory decision-making on prohibited grounds, such as race, sex, gender, social and ethnic origin.[98]

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92 Ibid. at 162.

93 Ibid. In South Africa, the provisions in POPIA are comprehensive and set out the conditions for the lawful processing of personal information. The eight conditions in POPIA are: (1) accountability; (2) processing limitation; (3) purpose specification; (4) further processing limitation; (5) information quality; (6) openness; (7) security safeguards; (8) data subject participation.'

94 Hendrickx at 166.

95 De Stefano at 22.

96 POPIA s 71(1).

97 Although there are exceptions in sub-s. (2), these exceptions are subject to checks to balances. A framework for enforcement, offences, penalties and administrative fines is provided for in POPIA, in the event of breach of its obligations.

98 As Leong explains, the problem, demonstrated by research, is 'that the same biases that infect the traditional workplace also affect new workplaces, such as the platform economy and workplaces that include new technology'. See Leong N 'The Race-Neutral Workplace of the Future' at 721. On the discriminatory impact resulting from the deployment of AI systems in the financial services industry in sub-Saharan Africa, see Ahmed S 'A Gender perspective on the use of Artificial Intelligence in the African FinTech Ecosystem: Case studies from South Africa, Kenya, Nigeria, and Ghana'.

10.5 Minimising the risk of artificial intelligence augmented bias and addressing systemic discrimination

It is widely recognised that AI technologies have the potential to 'reflect the biases of human programmers', as well as biases in the underlying data, which 'could augment discriminatory practices'.[99] Hence regulatory-enforced safeguards must ensure '[i]n the design and maintenance of AI . . . that the system is controlled for negative or harmful human-bias, and that any bias – be it gender, race, sexual orientation, age, etc. – is identified and is not propagated by the system'.[100] In other words, AI systems deployed in the workplace must not perpetuate or engage in any form of discrimination in any employment policies and practices.[101]

In South Africa, this is mandated by section 9 of the Constitution, which protects the right of everyone to equal treatment and prohibits, in both the public and private spheres, direct and indirect discrimination,[102] and furthermore establishes a framework for substantive equality.[103] These non-discrimination principles find expression in the EEA and the Promotion of Equality and Prevention of Unfair Discrimination Act.[104] The principles are broadly stated however, and additional, more nuanced and context specific guidelines and principles should be negotiated by stakeholders at the various levels (national, transnational and sectoral level, and in the workplace) in which AI systems are deployed. More broadly, PEPUDA constitutes an important regulatory tool for tackling 'systemic inequalities . . . embedded in social structures, practices and attitudes';[105] and towards humanising work as it 'endeavors to facilitate the transition to a democratic society . . . marked by human relations that are caring and compassionate, and guided by the principles of equality, fairness, equity, social progress, justice, human dignity and freedom'.[106] PEPUDA validates, and provides a legal foundation, for regulatory interventions that extend labour protection to categories of workers who are not excluded by law.[107]

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99 De Stefano at 28. On technologies that 'reinforce dominant social, political and economic trends' in the context of racial discrimination and xenophobia in border and immigration enforcement, see the Report of the Special Rapporteur on contemporary forms of racism, racial discrimination, xenophobia and related intolerance at 3.

100 UNI Global Union: *10 Principles for Ethical Artificial Intelligence* Principle 5.

101 E.g., AI systems used in recruitment processes must not be programmed to ask questions that are irrelevant nor programmed in a way that perpetuates historical exclusionary practices such as favouring workers who live within a certain geographical area, or who are English first-language speakers, or who have a certain educational qualification, in circumstances where these reasons are irrelevant and are not necessary requirements for the job.

102 Discrimination is indirect when an apparently neutral rule or requirement (e.g., a dress code that prohibits nose studs) disproportionately impacts a protected group, such as a group protected on the grounds of religion and culture. Other examples include requirements concerning height (which may indirectly discriminate on the basis of sex) or language proficiency (on the grounds of race or ethnicity).

103 Substantive equality envisages measures designed to promote the achievement of equality and to advance persons that have been disadvantaged by unfair discrimination.

104 Act 4 of 2000 (PEPUDA). The prohibition against unfair discrimination in the EEA applies to 'all employee and employers' (s 4) and also protects 'an applicant for employment' (s 9). The PEPUDA applies in all cases where the EEA is not applicable (s 5).

105 PEPUDA Preamble.

106 Ibid.

107 See *Mahlangu & another v Minister of Labour & others (Commission for Gender Equality and another as amici curiae)* [2021] 2 BLLR 123 (CC).

In the context of data processing, the prohibition against discrimination is further supported by the provisions in POPIA that limit the processing of special personal information, such as a persons' 'religious . . . beliefs, race or ethnic origin, trade union membership, political persuasion, health or sex life or biometric information'.[108] However, such processing is permitted with the consent of a data subject,[109] or if it is authorised by the statutory regulator, where it is necessary, or for a number of reasons justified by the provisions of POPIA. Again, more nuance guidelines should be developed in consultative processes between stakeholders, to elaborate on the implementation of non-discrimination, and the POPIA principles in the design and deployment of AI systems.

Although human rights and labour standards may exist in statutory form, they are often little more than 'paper tigers'[110] and are inadequate to balance the power, resource, and information imbalances between employers/firms, and those who work for them. As a countervailing force in labour law, a framework that enables social dialogue and the exercise of collective rights is as relevant today as it has ever been.[111]

10.6 Reaffirming and revitalising workers' collective rights

The right to organise and bargain collectively are fundamental labour standards[112] and, important, not only for negotiating wages and the economic conditions of employment, but also for the broader protection and enforcement of workers' rights, and as a counter to the power imbalance between workers and their employers.[113] Regulatory strategies in response to the deployment of AI in the world of work must thus take account of (low and declining) trade union density levels,[114] which is exacerbated by external restructuring and the outsourcing of work.[115] The organisation of work along

108 POPIA s 26 contains a general prohibition on processing of special person information, and other provisions in Ch. 3, Part B provide for the authorisation of processing in the circumstances prescribed by POPIA.

109 But an employee is unlikely to be in a bargaining position to withhold consent.

110 Being 'fierce in appearance but missing in tooth and claw'. Hepple B (ed.) *Social and Labour Rights in a Global Perspective* at 238; and in the context of South Africa, see Hepple B 'Negotiating Social Change in the Shadow of the Law' at 249.

111 As De Stefano sums it up at 41, 'collective regulation is essential to secure adequate labour protection in times of automation and technologically enhanced monitoring practices'.

112 At an international level, these rights (which are also protected in regional and national law instruments) are expressed in the ILO core conventions, specifically the Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87) and the Right to Organise and Collective Bargaining Convention, 1949 (No. 98), and are recognised as fundamental rights in the ILO Declaration on Fundamental Principles and Rights at Work, 1988, which member states must respect even if they have not ratified the specific conventions.

113 As De Stefano explains at 41, 'collective rights also serve as a fundamental tool to rationalize and limit the exercise of managerial prerogatives' and 'allow moving from a purely unilateral exercise of those prerogatives towards a consensual governance of work, by requiring negotiations on aspects of the business organization that would be, in lack of collective relations, unilaterally governed by employers'.

114 See ILO: 'Statistics of Trade Union Membership'. In South Africa, trade union membership sits at around 30 % of the workforce.

115 The outsourcing or relocation of work along value chains changes the power dynamic between employers and labour, weakening the bargaining power of labour and creating insecurity, and increased competition, within the workforce. See Flecker at 251.

value chains and the rise of the platform economy,[116] results in fragmented employment and geographically distributed work, and the 'increasing insecurity for an ever-larger part of the workforce'.[117] Critically, such external restructuring impacts the power dynamics between employers and workers, both at an individual and at a collective level, and the risk is a deterioration of employment conditions and the quality of jobs.[118] The ability of workers to organise and to bargain with the employer is impacted, yet the role of workers' organisations in the protection of workers' rights is crucial, for negotiating rights, and redundancies, and in the context of 'governing other implications of new technologies at the workplace, namely those affecting the quality of the jobs that will "survive" after automation'.[119]

Recognising the difficulties confronting workers' representatives and organised labour, the Global Commission on the Future of Work calls for *revitalising collective representation*.[120] Regulatory frameworks may need to be revisited, and barriers that impede the effective organisation and representation of workers must be dismantled, in order to promote freedom of association and the right of all workers, including self-employed workers and persons in the informal economy to organise and to represent their collective interests. Workers' organisations must also innovate their organising techniques to include the use of digital technologies to organise labour more effectively.[121] Moreover, the use of AI technologies as a governance tool presents an interesting possibility for the future convergence of technologies. An example is contained in the UNI Global Union: *10 Principles for Ethical Artificial Intelligence*, which provides that

> 'AI systems must include a check and balance on whether its deployment and augmentation go hand in hand with workers' rights as laid out in human rights law, ILO conventions and collective agreements. An algorithm "8798" reflecting the core ILO conventions 87 and 98 that is built into the system could serve that very purpose. Upon failure, the system must be shut down.'[122]

Managing the implementation of AI systems in an ethical and sustainable way raises complex issues, which should be governed through multi-stakeholder governance mechanisms.[123] The principle that labour is not a commodity[124] must be reaffirmed; and

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116 Initiatives to organise in the platform economy include the National Coalition of Ride Sharing Partners (NACORP) in Nigeria, which has adopted a framework for drivers to organise and is engaging in deliberative forums with stakeholders, litigation and lobbying for the rights of workers to unionise. See also the initiatives of the Transport Workers Union in Kenya, at https://www.tawu.org/.

117 Flecker at 254.

118 As Flecker explains at 260, 'cutting labour costs and achieving higher levels of flexibility without additional costs are among the main motives of externalisation and restructuring'.

119 De Stefano at 43.

120 ILO Global Commission on the Future of Work: *Work for a brighter future* at 41–43.

121 Ibid. 42. Digital technologies enable trade unions and worker organisations to connect with workers outside of the traditional workplace and provides a platform for innovative and inclusive organising strategies and a means to organise workers in the informal economy, and to work with cooperatives and community-based organisations on improving conditions of work in sectors that are not traditionally organised.

122 UNI Global Union: *10 Principles for Ethical Artificial Intelligence* Principle 7.

123 Principle 8 in the context of governance bodies on global and regional levels; and see the five recommendations for policy-makers in the OECD: *Recommendation on AI.*

124 ILO Declaration of Philadelphia, 1944.

the emphasis must be placed on the protection of human rights and a human-centred agenda for AI.

10.7 Concluding remarks: on responsible artificial intelligence and the future of labour laws in Africa

Although recognising that 'the use of AI technologies raises concerns of equity and ethics', the Forum on Artificial Intelligence in Africa is in agreement 'on the need to promote artificial intelligence in Africa as a lever for development, centred on the human dimension and anchored in universal ethical principles, as well as in the standards of human rights'.[125] In this regard, labour standards are human rights, and in the context of AI, labour laws are an important tool of governance and regulation for ensuring the responsible use and ethical governance of AI in the world of work, and as a mechanism for addressing concerns of equity.

The deployment of AI in the world of work provides an opportunity for harnessing the benefits that flow from the automation of work and work processes,[126] however, there are risks of harm as a result, including the possibility of large-scale job losses, and concerns that the integration of AI in the world of work may affect the conditions and quality of jobs that are not lost, as well as the quality of new forms of work, while recognising that the extent of the impact, and the associated risks disproportionately burden unskilled or semi-skilled workers.[127] As AI technologies increasingly shape the world of work, from the recruitment of workers to the termination of work arrangements, the ethical and sustainable use of AI must be informed by social dialogue at all levels: at the 'workplace', within industries and sectors, and at national, regional, and international levels. Developments, at all levels, must seek to 'foster innovation and trust in AI . . . while ensuring respect for human rights and democratic values',[128] and labour laws are an important consideration in this regard.[129]

The mechanisms of labour law[130] can play an important role in humanising work in an AI-driven digital age, however the boundaries of labour law will need to be reshaped

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125 The UNESCO: Outcome Statement of the Forum on Artificial Intelligence in Africa.

126 The deployment of AI technologies can improve efficiency and create a safer workplace, with advanced robotics assisting in and performing work that is hazardous for humans to perform.

127 Noting that the reduction in demand for low-skilled workers is likely to further exacerbate income inequality and may disproportionately impact the youth. See Sutherland at 247. Moreover, 'the predicted polarization of the labour market into low-wage service work and high-wage "knowledge" labour is likely to have different outcomes depend on workers' race or gender.' See Moradi and Levy at 276.

128 OECD: *Recommendations on AI* 3.

129 Initiatives such as the AU High Level Panel on Emerging Technologies (APET) and within the framework for the African Continental Free Trade Area (AfCFTA) are also relevant, and as these institutions, and governments on the continent, move to develop and implement AI policies and related regulatory frameworks, the role and development of labour law, as an instrument for the protection of human rights and enforcement of fundamental labour standards, should be an important consideration.

130 Including direct (command-and-control) regulation as well as governance-based approaches, including, in the context of AI in the world of work, collective bargaining and other mechanisms and institutions for participatory governance that promote decent work and sustainable development. See, e.g., Estlund C 'A return to governance in the law of the workplace' at 540.

to adjust to emerging technologies and AI. Key considerations for the future of labour law include the definitions that determine the scope of labour protection, and provisions clarifying the status, rights and duties, of workers and employers, and for ensuring the effective protection of fundamental rights, including the rights to privacy, equality and non-discrimination. The fundamental rights to freedom of association and collective bargaining and mechanisms to strengthen workplace democracy and social dialogue at all levels should be developed as important sites for negotiating AI and work in the digital age.

10.8 References

Ahmed S 'A Gender perspective on the use of Artificial Intelligence in the African FinTech Ecosystem: Case studies from South Africa, Kenya, Nigeria, and Ghana' (2021), presented at the International Telecommunications Society (ITS) 23rd Biennial Conference, 21–23 June 2021.

Andreeva A and Yolova G 'On Humanizing Work in the Digital Age' in Rahman M, Goel R, Gomes A and Uzzaman A (eds) *Redefining Global Economic Thinking for the Welfare of Society* (Pennsylvania: IGI Global, 2021).

AUDA-NEPAD: *AI for Africa: Artificial Intelligence for Africa's Socio-Economic Development* (2021) 19–25.

Baijnath M, Butcher N and Wilson-Strydom M 'Artificial Intelligence in Sub-Saharan Africa: Compendium Report' (AI4D Africa, 2021).

Biagioli M and Buning M 'Technologies of the law/law as a technology' *History of Science* (2019) 3.

Birhane A 'Algorithmic Colonization of Africa' SCRIPTed: *A Journal of Law, Technology, & Society* 17(2) (2020).

Choi J, Dutz M and Usman Z (eds) *The Future of Work in Africa: Harnessing the Potential of Digital Technologies for All* (Washington DC: World Bank, 2020).

Countouris N, De Stefano V, Piasna A and Rainone S (eds) *The Future of Remote Work* (ETUI, 2023).

Davis D 'The functions of labour law' *CILSA* (1980) 212.

De Stefano V '"Negotiating the Algorithm": Automation, Artificial Intelligence, and Labour Protection' *Comparative Labor Law & Policy Journal* (2019) 15.

Du Toit D 'Platform Work and Social Justice' 40 *Industrial Law Journal* (2019) 1.

Du Toit D, Fredman S and Graham M 'Towards Legal Regulation of Platform Work: Theory and Practice' 41(2) *Industrial Law Journal* (2020) 1493.

Dubber MD, Pasquale F and Das S (eds) *The Oxford Handbook of Ethics of AI* (Oxford: Oxford University Press, 2020).

Eke DO, Chintu SS and Wakunuma K 'Towards Shaping the Future of Responsible AI in Africa' in Eke DO, Wakunuma K and Akintoye S (eds) *Responsible AI in Africa: Challenges and Opportunities* 169–193.

Eke DO, Wakunuma K and Akintoye S (eds) *Responsible AI in Africa: Challenges and Opportunities* (Springer International Publishing Cham, 2023).

Estlund C 'A return to governance in the law of the workplace' in Levi-Faur D (ed.) *Oxford Handbook of Governance* 540.

European Commission, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: 'Artificial Intelligence for Europe' COM (2018) 237 final.

Fairwork: 'Principles' <https://fair.work/en/fw/principles/fairwork-principles-gig-work/>.

Flecker J 'Outsourcing, Spatial Relocation and the Fragmentation of Employment' *Competition and Change* (2009) 251.

Fredman S, Du Toit D, Graham M et al. 'Thinking Out of the Box: Fair Work for Platform Workers' *King's Law Journal* (2020) 236 (Fredman et al.).

Frey C and Osborne M 'The future of employment: how susceptible are jobs to computerisation?' Oxford Martin School (2013) <https://www.oxfordmartin.ox.ac.uk/downloads/academic/ The_Future_of_Employment.pdf>.

Hendrickx F 'Privacy 4.0 at Work: Regulating Employment, Technology, and Automation' *Comparative Labor Law & Policy Journal* (2019) 156.

Hepple B (ed.) *Social and Labour Rights in a Global Perspective* (Cambridge: Cambridge University Press, 2002).

Hepple B 'Negotiating Social Change in the Shadow of the Law' *SALJ* (2012) 248.

ILO Global Commission on the Future of Work: *Work for a brighter future* (Geneva: ILO, 2019).

ILO: *National tripartite social dialogue: an ILO guide for improved governance* (Geneva: ILO, 2013).

ILO: 'Statistics of Trade Union Membership' <https://ilostat.ilo.org/topics/union-membership/#>.

ILO: *Women and men in the informal economy: a statistical picture* 3rd edn (Geneva: ILO, 1918).

Le Roux R *Retrenchment Law in South Africa* (Durban: LexisNexis Butterworths, 2016).

Leong N 'The Race-Neutral Workplace of the Future' *University of California, Davis* (2017) 719.

Levi-Faur D (ed.) *Oxford Handbook of Governance* (Oxford: Oxford University Press, 2012).

Mignamissi D 'Digital Divide and Financial Development in Africa' Telecommunications Policy, 45.9 (2021).

Moradi P and Levy K 'The Future of Work in the Age of AI: Displacement or Risk-Shifting?' in Dubber MD, Pasquale F and Das S (eds) *The Oxford Handbook of Ethics of AI*.

OECD: *Recommendations on AI* 2.4. <https://en.unesco.org/artificial-intelligence/africa-forum>.

OECD: *Recommendations on Artificial Intelligence (AI)* (OECD/LEGAL/0449, 2019).

PC4IR: *Summary Report & Recommendations.*

Rahman M, Goel R, Gomes A and Uzzaman A (eds) *Redefining Global Economic Thinking for the Welfare of Society* (Pennsylvania: IGI Global, 2022).

Rainone S 'Digital and Remote Work: Pushing EU Labour Law beyond Its Limits' in Countouris N, De Stefano V, Piasna A and Rainone S (eds) *The Future of Remote Work*.

Report of the Special Rapporteur on contemporary forms of racism, racial discrimination, xenophobia and related intolerance (A/75/590, 10 November 2020).

Research ICT Africa: *Digital Futures: South Africa's Readiness for the 'Fourth Industrial Revolution'* (National Development Plan; 2020).

Statistics SA: Quarterly Labour Force Survey: <https://www.statssa.gov.za/publications/P0211/ Presentation%20QLFS%20Q1%202022.pdf>.

Sulla V, Zikhali P, Cuevas F *Inequality in Southern Africa: An assessment of the Southern African Customs Union* (Washington DC: The World Bank/IBRD, 2022).

Sutherland E 'The Fourth Industrial Revolution – The Case of South Africa' *POLITIKON* (2020) 233.

Tambe P, Cappelli P and Yakubovich V 'Artificial Intelligence in Human Resources Management: Challenges and a Path Forward' *California Management Review* (2019) 15.

Transport Workers Union in Kenya: <https://www.tawu.org/>.

Outcome Statement of the UNESCO: Outcome Statement of the Forum on Artificial Intelligence in Africa, 2018 <https://en.unesco.org/artificial-intelligence/africa-forum>.

UNI Global Union: *10 Principles for Ethical Artificial Intelligence* <https://uniglobalunion.org/report/10-principles-for-ethical-artificial-intelligence/>.

UNI Global Union: *Principles for Ethical AI*

UNI Global Union: *Top 10 Principles for Workers' Data Privacy and Protection* <https://uniglobalunion.org/wp-content/uploads/uni_workers_data_protection-1.pdf>

Wehde M 'Healthcare 4.0' *IEEE Engineering Management Review* (2019) 24.

Wikipedia: Sophia (Robot) <https://en.wikipedia.org/wiki/Sophia_(robot)>.

World Bank: *Inequality in Southern Africa: An Assessment of the Southern African Customs Union* (World Bank, 2022).

World Economic Forum: 'The Future of Jobs Report' (2018) <https://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf>.

Chapter 11

The use of artificial intelligence in legal process and business

> 'Lawyers and judges are steeped in tradition and contained by precedent. By disposition, they are often conservative and risk-averse. My research elsewhere suggests that in the great pantheon of professions, certainly in relation to technology, only the clergy are more cautious about change. The comfort zone of lawyers is the courtroom rather than the online collaborative shared space.'[1]
>
> Richard Susskind *Online Courts and the Future of Justice*

11.1 Introduction

Artificial intelligence (AI) is set to become a central part of the online collaborative space referred to here by Susskind,[2] and is the focus of this book. AI refers to systems that display intelligent behaviour by analysing data and taking actions, including, but not limited to, decisions and predictions – with some degree of autonomy – to achieve specific goals.[3]

For many years now, the proliferation of AI in all realms of human industry (commonly referred to as the Fourth Industrial Revolution (4IR)) has been occurring in incremental stages, and it has included the legal sector in its ambit. Thinking and writing about the use of AI in the legal sector began decades ago. For instance, the first issue of the *Artificial Intelligence and Law* journal was published in 1992.[4] Writers such as Susskind have been advocating for effective use of legal technology in general and AI in particular in the legal process since the 1980s.[5] Carefully erected protections that have hitherto shielded the legal profession from change are being eroded and the foundation of the monopoly over legal work and practice is beginning to crumble due to AI and technology generally.[6] AI development has begun penetrating the mainstream and is being deployed inside legal tech tools that perform tasks which were once the sole purview of lawyers.

Many books and articles discussing the future of the legal profession make the general point that, while the legal profession is an ancient one that is steeped in tradition and classical thinking, technology marches ever forward and accelerates seemingly every day, and the lawyers who remain static in the face of ever-advancing technological

1 Susskind R *Online Courts and the Future of Justice*.
2 Ibid.
3 Gwagwa A et al. *Artificial intelligence (AI) deployments in Africa: Benefits, challenges and policy dimensions* (Gwagwa et al.) at 26.
4 Villata et al. 'Thirty years of artificial intelligence and law: the third decade' at 561–591.
5 Susskind RE *Expert Systems in Law: A Jurisprudential Inquiry*.
6 Adeyoju A 'Artificial Intelligence and the Future of Law Practice in Africa'.

changes and persist in discussions about the merits of these changes, even while they are happening before their very eyes, risk becoming overwhelmed and even redundant.[7] 'Do we drive the change, or will we be overcome by the transformation?'[8]

Research on the use and perception of AI in the legal industry in Africa, albeit limited, suggests that legal professionals in Africa, in contrast to those in developed Western countries, are overall hesitant and even fearful of this technological change, and will thus continue to be slow to adopt it without further awareness being raised and training being done.[9]

This chapter therefore examines the use of AI in legal process, practice and business in Africa. It examines the deployment, development and capabilities of AI as it relates to legal processes and it also identifies some existing and potential application of AI in Africa. Lastly, it identifies some challenges in the incorporation of AI in Africa's legal practice and suggests a way forward.

11.2 Artificial intelligence deployment and development and capabilities

Gwagwa argues that AI development on the continent can be divided into two categories, namely (a) collaboration between foreign AI platforms or applications and local developers, and (b) standalone local startups. These two categories are not discrete, as there are also instances where standalone startups rely on AI technology owned by a foreign company, such as where 'a standalone web-based platform or business website may plug into Facebook Free basics or a local start up servicing a big financial institution may rely on Artificial Intelligence as a Service (AIaaS) platforms such as Amazon AI services, IBM Watson Assistant, Microsoft Cognitive Services and Google AI services'.[10]

Global businesses such as Facebook and Google seem to have taken an interest in ways to make their AI-centred resources available to those who seek to solve real-world problems in Africa. UNICEF, Super Sport and Malaria No More have adopted Facebook's Free Basics application to make use of Facebook's data intelligence capabilities, and Google has made its AI machine, TensorFlow, available open source to developers. For instance, in Africa, there was the opening of an AI lab in Ghana.[11]

11.2.1 *Some artificial intelligence capabilities*

Advancements in AI and machine learning in the legal sector have largely happened within the closed system made up of commercial legal service providers competing in the same markets. Each company promises to provide more advanced and sophisticated services than its competitors, keeping its methods and code closely guarded as trade secrets.

7 Davis AE 'The Future of Law Firms (and Lawyers) in the Age of Artificial Intelligence'; Ajayi J 'Artificial Intelligence in the Nigerian Legal Industry: A Threat or an Opportunity?'
8 Liquid Legal: 'Towards a Common Legal Platform' at vii.
9 Kufakwababa CZ 'Artificial intelligence Tools in Legal Work Automation: The Use and Perception of Tools for Document Discovery and Privilege Classification Processes in Southern African Legal Firms'.
10 Gwagwa AE 'Artificial Intelligence adoption and use cases in Africa' (Gwagwa) at 1.
11 Gwagwa at 2.

The word 'open', in relation to content, data and knowledge, has been defined by the Open Knowledge Foundation as referring to something that 'can be freely used, modified, and shared by anyone for any purpose'.[12] 'Open source' refers to software that can be used, modified or shared by anyone because its source code is freely accessible, while proprietary software can only be modified by the person who has authority to do so. Since it was coined, open source has evolved from being a technical, descriptive term to being broadly expressive of an approach to software development that embraces an ethos of 'open exchange, collaborative participation, rapid prototyping, transparency, meritocracy, and community-oriented development'.[13]

Although proprietary and open-source AI have different beginnings, this does not necessarily mean that they will have different deployment destinations – some proprietary AI systems are deployed in public fora, such as the courts, where they impact on the general public. Transparency is important for AI applications that is deployed in the public space such as the administration of justice either through legal practice or court or judicial processes. For instance, in the United States, the use of proprietary software in the criminal justice system has attracted controversy. Some States in the United States have implemented a set of tools known as COMPAS (Correctional Offender Management Profiling for Alternative Sanctions), which is owned by Equivant. This software is described by Equivant as 'a set of web-based risk and needs assessment tools designed to assist criminal justice agencies in making decisions regarding the placement, supervision and case management needs of criminal offenders'.[14] COMPAS was first introduced in 1998 and has been used at various stages of the criminal justice process. In 2016, an article, which argued that COMPAS is biased against black defendants, appeared on the website of ProPublica.[15] The article was widely read and shared among the public and caused a great deal of distrust in COMPAS in particular and recidivism algorithms in general.

While the problem with COMPAS is essentially that of the quality, objectivity or bias of the datasets that has been used to train the AI, this also indicates the need for transparency and regulation of AI and its use generally, and particularly in the legal forum. While AI has lots of benefits, its development and use must be regulated to ensure it does not ultimately cause more harm than good. Hence, the European Union (EU) for example actively seeks to regulate AI through the proposed AI Act. If it goes through as intended, this will provide a regulatory framework to ensure that the development and deployment of AI ensures it is safe, transparent, traceable, non-discriminatory and environmentally friendly.[16] The Act also proposes that AI systems should be overseen by people and not automated to prevent harmful outcomes.[17]

We now proceed to examine two key capabilities of AI which are natural language processing (NLP) and predictive algorithms.

(a) Natural language processing

NLP refers to 'the branch of artificial intelligence or AI concerned with giving computers the ability to understand text and spoken words in much the same way human

12 Open Definition: 'Defining Open in Open Data, Open Content and Open Knowledge'.
13 Opensource.com: 'What is open source?'
14 Equivant: FAQ.
15 Angwin J et al. 'Machine Bias'.
16 European Parliament: 'EU AI Act: first regulation on artificial intelligence'.
17 Ibid.

beings can'.[18] NLP is a core component of many offerings in legal tech, which is unsurprising given that so much legal work depends on the interpretation and analysis of vast amounts of written text. Global AI giant, IBM, explains:

> 'The earliest NLP applications were hand-coded, rules-based systems that could perform certain NLP tasks, but couldn't easily scale to accommodate a seemingly endless stream of exceptions or the increasing volumes of text and voice data. Enter statistical NLP, which combines computer algorithms with machine learning and deep learning models to automatically extract, classify, and label elements of text and voice data and then assign a statistical likelihood to each possible meaning of those elements. Today, deep learning models and learning techniques based on convolutional neural networks (CNNs) and recurrent neural networks (RNNs) enable NLP systems that "learn" as they work and extract ever more accurate meaning from huge volumes of raw, unstructured, and unlabeled text and voice data sets.'

Like all algorithms and AI tools, the correctness and efficiency of an NLP system depends largely on the quality, accuracy and comprehensiveness of the dataset that it uses as a basis for the execution of its functions. Gwagwa et al. state that many African languages are 'low resource languages' in the digital realm, meaning that 'there are insufficient examples of use of the languages available online for the purposes of training NLP applications'.[19]

Even though English, French, Portuguese and Arabic – which are not indigenous African languages – are the primary languages used in the legal sectors of African jurisdictions, legal documents are nonetheless interlaced with localised expressions, turns of phrase, nuances, ambiguities and contextual idiosyncrasies that may be unique to each jurisdiction. In Uganda, for example, the word *mailo* is used to denote a specific system of land tenure that is unique to Uganda,[20] and Ugandan lawyers and judges use this term without always providing contextual information or a definition. Similarly, South African judgments often refer to the concept of *ubuntu*, which has a nuanced and constantly evolving meaning.[21] The use of localised words and phrases in legal documents is further complicated by the interspersal of legal jargon, both organically developed and inherited from English or Roman-Dutch legal roots. The development of truly organic African jurisprudence is to be welcomed and must never be hampered by the suppression of local legal-linguistic idiosyncrasies in favour of Western equivalents. In India, OpenNyai has initiated a project aimed at 'building benchmarks for Indian legal NLP on several key AI tasks such as Named Entity Recognition, Judgement Summarisation and Question Answering etc.'[22] The creation of legally-specific NLP benchmarks and standards for African jurisdictions, either by means of hand-coded rules or by the implementation of statistical NLP, is thus critical for developing the capacity for NLP applications to interpret and generate text correctly.

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18 IBM: 'What is Natural Language Processing?'

19 Gwagwa et al. at 9.

20 Land Portal: 'The private Mailo tenure system'.

21 Himonga C, Taylor M and Pope A 'Reflections On Judicial Views Of Ubuntu'; Kamga SD 'Cultural values as a source of law: Emerging trends of ubuntu jurisprudence in South Africa' at 625–649.

22 OpenNyAI: 'Benchmarks for Indian legal NLP'.

(b) Predictive algorithms

A predictive algorithm is a tool that predicts the outcome of a certain scenario based on factors that exist in meaningfully similar previous scenarios. One such tool is COMPAS, the recidivism prediction tool mentioned above. In simple terms, COMPAS uses data about a particular subject (the accused person in a criminal trial) to predict how likely the subject is to perform certain actions, such as committing a crime in future. Predictions of these kinds are used to make decisions about whether or not the subject should be granted bail, or given a custodial sentence etc. However, as ProPublica discovered, COMPAS was effectively making racially biased predictions – it was giving black defendants higher risk scores than white defendants in similar or identical positions.

Mayson delved into this subject and explained that the problem with such tools lies in the nature of predictions itself, rather than in the tool or how it works.[23] Black people are over-represented in the US criminal justice system, and this is subsequently reflected in the data on which the tool bases its prediction. Moreover, the tool uses the likelihood of arrest as a marker of the likelihood of committing future crime, and data has shown that black people in the US are arrested at higher rates than whites. Absent any intervention, she argued, the predictive tool would predict that the over-representation of black people in the criminal justice system would simply continue to exist, and this explains the fact that black people are given higher risk scores than whites. Even if the tool doesn't take race into consideration as a factor, the tool can effectively use other factors as proxies for race, such as socio-economic factors or geographical data. Ultimately, Mayson found that there was no immediate solution to this problem, noting that removing race and racially-significant factors from the analysis or incorporating an affirmative action mechanism into the tool would simply undermine the accuracy of the prediction and render its predictions effectively useless.

Racial bias (as well as gender, class, disability and other kinds of bias) occurs in human form often enough to warrant a search for an objective AI alternative, but there is little utility in replacing a potentially biased human being with a potentially biased algorithm due to biased dataset used to train the algorithm thereby producing skewed results. More work needs to be done to improve the usefulness of predictive algorithms and by the same token, any predictive method, by ensuring the objectivity and quality of the dataset used to train the AI before AI predictive tools can be reliable for use in the legal sector.

11.3 Some existing and potential future applications of artificial intelligence in African legal sectors

AI-assisted legal services have begun to permeate the legal-services industry in Africa. This refers to the use of AI tools that either perform a task which is normally performed by a lawyer or that assist lawyers in performing their work.

The adoption of AI tools that perform legal functions on the African continent and in developing countries generally has been slower than in developed Western regions such as the United States, Canada and the UK. Research on the use and perception of AI tools in the legal sector in Southern African countries indicates that adoption has

23 Mayson SG 'Bias In, Bias Out'.

been somewhat limited and slow, partly due to fears that legal professionals have over the potential of legal AI tools to replace them, and partly because there is a lack of awareness of how the tools that are available, work or how they can be beneficial to lawyers.[24] Kufakwababa writes that while a few firms in South Africa have started to actively engage with AI technologies, specifically when it comes to document review, contract review or drafting and legal research tasks, firms in other Southern African countries are not yet embracing AI.[25] Kufakwababa explains the peculiar focus of AI on document-based work as follows:

> 'The nature of the rules for coding are simple and easy to follow. It is easier to make a computer learn and unlearn rules of contract drafting, as they are clear and linear. However, when it comes to learning and computer-aided predictions less has been done in the developing countries; and there the practice has remained centred on human/attorney interaction.'[26]

Nevertheless, there has been some implementation of AI in legal services. The following sections explore some of the most noteworthy examples.

11.3.1 *Artificial intelligence document review and drafting*

One of the trends seen in the past decade is the increasing automation of document review tasks, which are usually either performed by lawyers or outsourced by law firms to qualified contractors. Document review is time-consuming, repetitive and requires attention to detail, all of which are factors that make a task ripe for automation. E-Discovery is an example of the use of AI to review documents or evidence at the preliminary stage of litigation. Relevant tools such as like relativity and ringtail assist in reducing the number of documents reviewed by lawyers and decide documents to prioritise its review. This reduces hours and costs of review, thereby producing a core volume of evidence for litigation.[27]

Some of the AI-based tools that have been deployed for document review are:

(a) Kira

Kira, provided by Kira Systems, is machine learning software that searches and assists with the analysis of contracts and other documents. It can use NLP to identify, extract and analyse portions of text, such as specific types of contract clauses, based on the instructions given to it by the user. Kira is marketed to law firms as a tool that can increase the speed and efficiency with which they perform due diligence, contract review, and contract drafting tasks, and was adopted by pan-African law firm Bowmans in 2018.[28]

(b) Luminance

Luminance is machine-learning software that performs similar functions to those performed by Kira – primarily document analysis. Webber Wentzel, one of Africa's largest firms, adopted Luminance in 2018 to support its due-diligence processes,

24 See Kufakwababa.
25 Ibid. at 1.
26 Ibid. at 12.
27 CDS: 'The Basics: What is e-Discovery?'
28 Truter C 'Bowmans among the First in Africa's Legal Market to Invest in Artificial Intelligence'.

especially in the course of providing legal support for mergers and acquisitions and other complex transactions.[29]

(c) COIN

COIN is an acronym for 'contract intelligence', a machine-learning tool developed and deployed by JP Morgan to assist with reviewing large volumes of text-based data. JP Morgan first created COIN to analyse patterns and classify specific types of clauses in its credit contracts, a task which it previously paid lawyers to perform, but it has refined COIN to expand into more complex analytical work.[30]

The adoption of AI tools to perform document review and analysis seems to be limited to the largest and most well-resourced firms on the continent. Medium and smaller firms may not automate document-review tasks simply because they do not take on volumes of work large enough to necessitate it, or because they cannot afford to buy, develop or use the types of tools listed here.

11.3.2 *Digital justice systems*

One of the most widespread implementations of NLP is in digital justice platforms although not all such platforms use NLP. The digital justice platform CaseLines, for instance, is a popular legal-tech product that was piloted at South Africa's North and South Gauteng High Courts in January 2020[31] (though the national rollout plans were put on hold amidst claims that the contract was unlawfully awarded)[32] as well as the Common Market for Eastern and Southern Africa (COMESA) Court of Justice.

CaseLines has proven to be so popular that it was acquired by Thomson Reuters in 2020. McNerney, CEO of CaseLines, reports that moving courts to an online platform through technology has led to beneficial outcomes for court staff, judicial officers, and others who are involved in the court process, including litigating parties and witnesses in trials. The most immediate benefit is the reduction in the amount of paper used in courts, along with the resource, time and staffing costs incurred by procuring, organising, storing and transporting paper-based case files and other documents, which McNerney cites as a 'significant reason' for the 'appetite for change and improvement' in African courts.

Online justice platforms can bring about greater security through storing case data in the cloud, and CaseLines in particular makes it possible to manage permissions associated with files at a granular level. There is also greater ease and speed in accessing, navigating and annotating case data. In a criminal case, for example, CaseLines allows for all the statements, police reports, documentary evidence, notes and other documents involved to be stored and managed in one place, where they can be read, searched and redacted as necessary, even where text is handwritten (a function that requires AI in the form of NLP).[33] McNerney writes that

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29 Webber Wentzel: 'Webber Wentzel deploys Luminance's artificial intelligence platform in South Africa'.

30 Legal ML 'JP Morgan COIN: A Bank's Side Project Spells Disruption for the Legal Industry'.

31 South African Judiciary: Court Online.

32 Verster J 'Former office of the chief justice officials accused of benefiting from R225m IT contract -report' News 24 (12 June 2022).

33 CaseLines: 'CaseLines 15 Minute'.

> 'an unexpected early benefit seen in the UK's Crown Court was a 50% reduction in hearings as a result of earlier access to evidence and more early guilty pleas. Using digital software has also made securing testimony much easier. Also, policemen need no longer take time off work to travel or attend court, but can provide a digital testimony instead, while vulnerable witnesses can be spared the difficulties of being present at a trial.'[34]

In Zimbabwe, a similar system called Synergy CMS, developed by US-based firm Synergy International Systems, has been rolled out.[35] This system reportedly uses AI for case allocation, 'according to case subject, case weight, and each user's existing caseload'.[36] The details of precisely how this AI works are not freely available. In Lesotho, Synergy implemented a Case Management and Tracking System for the Lesotho High Court, Commercial Court, and Maseru Magistrate Court in 2013, jointly funded by the Government of Lesotho and the Millennium Challenge Corporation (MCC).[37] In Rwanda in 2016, Synergy created and implemented the Integrated Electronic Case Management System (IECMS), which Synergy describes as 'a unifying platform that connects all institutions belonging to the Justice, Reconciliation, Law and Order Sector'.[38] In Uganda in 2019, Synergy partnered with Ugandan IT firm Sybil Limited to develop the Uganda Electronic Court Case Management Information System (ECCMIS), which promises to 'automate and track all aspects of a case life cycle for all courts of the Ugandan court system (the Supreme Court, the Court of Appeal/Constitutional Court, the High Court, and the Magistrates Courts)'.[39]

The regulatory framework for digital justice interventions has also begun to be put in place across the continent. Practice directives on electronic case management or digital justice platforms have been issued in various African jurisdictions including Kenya,[40] South Africa,[41] Zimbabwe, and the COMESA Court of Justice. In Nigeria, Chief Justice Ibrahim Tanko Muhammad commissioned a digital courtroom for Nigeria's Federal High Court, and Chief Judge of the Federal High Court, Justice John Tsoho, said that several practice directives have been issued.[42] In Uganda, the ECCMIS was officially launched at the Judiciary Headquarters in Kampala in March 2022, and went live at some of the country's top courts. At the launch, 'Mr Ssinabulya Joseph, the Senior Information Technology Officer said that ECCMIS will facilitate efficient and reliable collection, organization, distribution and retrieval of significant amounts of case-specific data. The system was also programmed to processes payment of relevant court fees/fines and enables easy generation of reports.'[43] The judiciary had already begun

34 McNerney J 'How Africa's Courtrooms Became As Advanced As Anywhere In The World'.
35 Muhamba V 'US firm wins US$3 mil tender to deliver case management system to JSC'.
36 Synergy International Systems: 'Factsheet'.
37 Synergy International Systems: 'Lesotho Court Case Management System'.
38 Synergy International Systems: 'Rwanda's Justice Sector Integrated Electronic Case Management System'.
39 Synergy International Systems: 'Uganda Electronic Case Management Information System Project Inception Workshop'. See also Synergy International Systems: 'Judiciary of Uganda Commissions the Electronic Court Case Management Information System'.
40 See Kenya Law: 'Practice Directions on Electronic Case Management'
41 South Africa Judge President's Practice Directive 1 of 2021.
42 Ochojila A 'Examining the workability of virtual trial in Nigeria'.
43 Judiciary of Uganda: 'Judiciary Launches ECCMIS'.

building a regulatory framework for this eventuality by issuing the Judicature (Visual-Audio Link) Rules, 2016 (SI 26 of 2016) and the Constitution (Integration of ICT into the Adjudication Processes for Courts of Judicature) Practice Directions, 2019.[44]

11.3.3 *Legal research and publishing*

Given that AI is well suited to analysing large volumes of text-based data, it is well suited to perform research tasks such as analysing case law, case files and supporting documents, and legislation. AI has thus found its way into the offerings of commercial legal publishers.

The predictive capabilities of AI has found valuable applications in legal research. Lexis Advance, for instance, is a suite of tools that bolster legal research by automating certain analysis tasks. These tools can be used for a huge variety of tasks, from quantifying damages to identifying the language that particular judges find persuasive. Lex Machina is a tool that mines litigation data to identify trends and provide insights on lawyers, judges, expert witnesses and even parties,[45] thus promising legal professionals a significant edge over competitors in their profession.

Legal tech which may qualify as AI can also be found in the offerings of free legal resource libraries. Because case law and legislation are public documents, the raw data needed to develop and train an AI legal research tool should already be able to use it without fear of infringing on copyright. The prospect of developing such a research tool is available to anyone who has the initiative, time and skills needed. Laws.Africa, for example, has developed software that can make consolidated legislation available online, accessible to anyone, for free.

In 2019, Greg Kempe, the co-founder of Laws.Africa, made the argument that governments needed to stop investing in 'undifferentiated heavy lifting' when disseminating legislation. This phrase (famously used by Amazon CTO Werner Vogels) refers to the time and resources that various companies spend on doing work that is also being done by other companies at the same time and for the same purposes, and that doesn't add value or differentiation to their offerings. Kempe pointed out that, across Africa, this same phenomenon occurs in the legal sector, for the dissemination of consolidated legislation: commercial publishers have been doing the work of

> 'taking the original acts from the Government Gazettes, re-capturing and typesetting them, consolidating them by applying amendments, and publishing them. A public function – disseminating the law – has been privatised. To work with and use the law, civil society, the government and the private sector must either perform these same laborious tasks or pay others who have performed them. This is undifferentiated heavy lifting.'[46]

For AI tools to be developed by local innovators or even foreign companies, in a way that allows Africa to compete on the global stage, undifferentiated heavy lifting in the creation and dissemination of legal datasets must be recognised as an unaffordable setback and effectively eradicated.

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44 Murungi E and Tusime T 'Covid-19: Why an Electronic Case Management System is a Necessity in Uganda'.

45 Baginski K 'Legal Analytics and Artificial Intelligence for Research & Law Practice: Tools, Features & Functionality'.

46 Kempe G 'What Government and the Law can Learn from Cloud Computing's Success'.

11.3.4 *Dispute resolution*

Nigerian lawyer and author Agunbiade has made an argument for the use of AI in dispute resolution in Nigeria and beyond,[47] an idea generally supported by Susskind as 'only one of a range of proposed extensions of traditional court services, all of which have the collective aim to *dissolve* or *divert* simmering legal disagreements' (original emphasis), dispensed by way of an 'online triage' system.[48] An online tool of this nature stands to be hugely beneficial in reducing the endemic court backlog that plagues many African communities, and thus go some way towards addressing the access to the justice gap.

Although an AI dispute resolution tool is yet to be developed and deployed in Africa, it is possible to have regard to dispute resolution tools that make use of AI which have been created and deployed in the UK as a potential future solution for African states.

As is explained by Vos, these tools take the form of an app which allows a potential claimant to progress a claim of any kind:

> 'Claimants will then be signposted to a series of pre-action portals and ombuds processes to identify and seek to resolve their claim. Any claim that is not resolved within the appropriate pre-action space will already have a data set that can be transmitted by API directly to the third layer of the funnel. That third layer is the court-based online justice process epitomised already by Online Civil Money Claims and Damages Claims Online.'[49]

Furthermore, he explains, '[a]lmost 300,000 OCMC claims have already been made online, and Damages Claims Online is taking off rapidly and will soon be joined by Possession Claims Online. There are compatible systems for public and private family claims and for immigration and employment tribunal claims.'[50]

How would it work? The potential practical functioning of an online dispute resolution tool is posited by Vos thus:

> 'Some less important issues will be resolved online either administratively for very minor questions, such as whether a response is to be made by 4pm on Monday or Wednesday, or asynchronously by a judge for more significant questions. Remote or court hearings will remain for judicial resolution of the significant issues that ultimately emerge from the process.'[51]

Agunbiade proposes a similar system to be used in Nigeria:

> 'The proposed AI system . . . will work with predictive intelligence. In other words, based on the individual facts of the case in question, it will predict the possible outcome of the case. Based on the predictions, the case may either proceed to court or be resolved using Alternative Dispute Resolution (ADR) mechanisms.'[52]

Such a system would need to be developed in collaboration with, and overseen by, the relevant authorities; not only to ensure its proper functioning but also to give the system much-needed authority and legitimacy in the eyes of the profession and the public.

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47 Agunbiade A *Artificial Intelligence and Law: A Nigerian Perspective*.
48 Susskind *Tomorrow's Lawyers: An Introduction to the Future* at xi.
49 Vos, Sir Geoffrey 'The Future for Dispute Resolution: Horizon Scanning'.
50 Ibid.
51 Ibid.
52 Agunbiade at 43.

Agunbiade writes that in Nigeria, such a system is likely to be limited to civil claims, at least initially, in its application, due in large part to the aforementioned risks of AI systems making biased predictions and decisions. However, he writes,

> '[c]ivil suits on the other hand involve private individuals, and are less likely to raise eyebrows. It is also easier to implement as individual states can effectively pass laws for that purpose without recourse to the Federal Government. Civil Procedure in some states in Nigeria like Lagos, tend to be more progressive and amenable to change, as opposed to criminal laws. Once a few progressive states implement it successfully, it will gradually spread to other states, and possibly, create a positive groundswell of opinion in favour of incorporating AI in the criminal justice system, with some slight modifications.'[53]

It is submitted, however, that the potential for bias in predictive algorithms poses equally significant harm in civil claims as in criminal ones, and would need to be effectively addressed before such a solution can be deployed.

11.3.5 *Commercial contracting*

AI is applied to contracts, particularly commercial contracts, by assisting in drafting, review and management of such contract.[54] The AI automates commercial contracting by relying on already trained algorithms that identify specific contract patterns and processes and then arrange the unstructured points in the proper format.

AI can assist in contract drafting using pre-approved words and can give recommendation on appropriate works to be used in a contract. They can also be used to generate contract templates. Furthermore, they can assist with contract review to identify potential risks and concerns thereby saving time as a lawyer will only need to proofread or vet what the AI has done. AI may also assist in contract negotiation, including using chatbot in e-commerce transactions. Again, humans may still be involved in the process and this is not suitable for all kinds of negotiations. Many law firms have to deal with a large number of contracts and keeping up with dates, terms, and actions can be inundating. AI therefore comes in handy to assist in managing those contracts by clarifying data and organising relevant dates.[55]

An argument is now put forth that the power of these tools can and should be leveraged in the legal sector to address the pressing need for access to justice in Africa, and that there is already a legal framework in place that demands this.

11.4 Access to justice as a lodestar for artificial intelligence development

Access to justice is a core element of modern democratic jurisprudence all over the world. It is a basic human right in terms of Articles 7 and 8 of the Universal Declaration of Human Rights (1948).[56] Goal no. 16 of the UN's 2030 Agenda for Sustainable Development is to 'promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels', and Target 16.3 associated with this goal is to 'ensure equal access

53 Ibid. at 42.
54 LegalMart: 'How is AI transforming Contracts?'
55 Rich B 'How AI Is Changing Contracts'.
56 See UN: 'Universal Declaration of Human Rights'.

to justice for all'.[57] In Africa, access to justice is enshrined in Articles 3 and 7 of the African Charter on Human and Peoples' Rights (1981),[58] and is guaranteed as a constitutional right in terms of the constitutions of various African countries.[59]

There is an adage well-known among computer-science students and tech enthusiasts alike, namely 'garbage in, garbage out', which means that if you input poor data, a program (whether it makes use of AI or not), it will produce poor output. While access to justice and access to information have been recognised as interlinking rights, in the context of a justice system where AI tools rely on quality and comprehensive machine-readable data to make fair decisions and accurate predictions, access to data takes on critical importance. Therefore, access to justice, information and transparency must be the guiding principles of any AI deployed in the legal process, system and practice.

Furthermore, Article 25 of the AU Charter places a duty on States parties to 'promote and ensure through teaching, education and publication, the respect of the rights and freedoms contained in the present Charter and to see to it that these freedoms and rights as well as corresponding obligations and duties are understood'. This provision, read with Articles 3 and 7, implicitly places an obligation on judiciaries to make case law available to the public, even in civil-law jurisdictions where case law does not create binding legal precedents. This is not only because case law has persuasive value in civil jurisdictions but most importantly because written submissions, judgments, court orders and even court rolls represent an invaluable dataset that must inform the development of access to justice and dispute resolution initiatives and interventions. AI can therefore be deployed in making case law available to the public in order to provide education, enlightenment and awareness on the rights and freedoms available under the law.

The Constitutional Court of South Africa, for example, has realised this and for each judgment delivered by the court, its library places a full item record online for public scrutiny. This record includes all preliminary papers including founding and answering affidavits, notices of motion, summons, heads of argument, and other written submissions by the counsel of litigating parties as well as *amicus curiae.*[60] AI has also been deployed to assist with legal processes such as donotpay.com which offers legal assistance for small-claims issues such as parking tickets, creating legal templates and documents among others, although it has been criticised by some with bad reviews. Other similar AI tools include Rocket Lawyer, LegalZoom, Avvo, LawDepot, Nolo among others.[61] These are all examples of using AI to promote access to justice through process automation. Justice, fairness and transparency must however still be the lodestar of the development and deployment of these tools. For instance, donotpay.com has been criticised for being available only in the USA despite claims of being available worldwide. It also deducts annual subscription even when users are informed it is a

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57 UN Statistics Division: 'SDG Indicators'.

58 African Charter on Human and Peoples' Rights (1981) Art. 3 guarantees equality before the law and equal protection of the law, while Art. 7 guarantees the right to have one's cause heard.

59 Constitution of the Republic of South Africa, 1996 s 34; Constitution of the Republic of Namibia, 1990 Arts 5 and 12.

60 See Constitutional Court Cases & Judgments at https://collections.concourt.org.za/handle/20.500.12144/1.

61 Ryan M 'Donotpay Reviews: Is Donotpay Legit As A Legal Tech Platform Or Scam?'.

free trial, users complained. Users further complained that the chatbox and customer-service contacts are not responding.[62] Another example is the feeding or training AI with biased or nuanced data which can lead to injustice as was the case with COMPAS, as discussed earlier.

11.5 Tackling challenges and charting a way forward

> 'It is widely acknowledged in the technology community that the best way to introduce complex new systems is to start simply and build incrementally, informed by experience. It is also widely held that to begin with the most challenging problems and systems and to develop ground-breaking systems from scratch is inadvisable'.[63]

The development and deployment of AI in the African continent stands to be a huge boon to the legal sector. With a smart approach that incorporates incremental and informed step-by-step development, which is slowly scaled and monitored to ensure reliability and efficiency, Africa-based innovators can develop and market powerful AI solutions that can boost the work of legal professionals and begin to address the access to justice gap.

Arguably the biggest challenge that prevents the successful implementation of AI tools, particularly legal research and analysis tools, is the lack of publicly available data in the form of judicial precedent online. Without a complete, high-quality supply of court decisions, an AI tool like Lex Machina cannot be used to make reliable predictions of the success or failure of any given litigation strategy. Some countries (such as South Africa, Kenya and Tanzania) have well-established legal information institutes (LIIs) that have made considerable collections of judgments available online and are updating them regularly, but in other countries, where case law is only available in part or is kept behind a paywall (including countries with large legal economies, such as Nigeria), it is going to be almost impossible to develop a valuable predictive tool.

The reliability and utility of these solutions depends, as has been demonstrated here, on those tools being trained on sufficient, comprehensive and high-quality local datasets of legal information, and the incorporation of locally-developed NLP standards, rather than cut-and-pasted datasets and standards that originate in the global North. Therefore, this raises the need to first digitalise comprehensive legal data in Africa that is needed to train AI. These datasets can then be deployed in AI development. This is a major challenge that must be surmounted if AI is going to be effective in the legal process and practice in the attainment of justice.

In their analysis of AI deployments in Africa, Gwagwa et al. identify 'the two themes most central to understanding the implications of AI in Africa' as equity (focussing on gender equity and cultural and linguistic diversity) and labour.[64] They acknowledge that privacy and surveillance are also thematic areas of concern, but that these areas do not necessitate distinctly localised approaches as much as equity and labour do. If access to justice is to be our lodestar, and equal protection of the law and equality before the law are seen as core elements of access to justice, then equity must be a primary concern

62 Trust Pilot: 'DoNotPay'; Quora: 'Is the DoNotPay app a legitimate app that is safe and effective to use'.
63 Susskind at xxxvi.
64 Gwagwa et al. at 6.

at every stage of AI development. This includes making equality of representation and inclusion a priority in every stage of the gathering of the data that will become the AI's raw reference material for making decisions or predictions. One of the major challenges is thus to ensure the inclusiveness of data gathering efforts, whether those efforts are intended to support legal AI research and development or not. It is likely that even now, before the AI tools that will find widespread application in legal systems in Africa are developed, the data that they will refer to is already being collected – and if that data contains gaps, the algorithms working with it will reproduce those same gaps, thus entrenching and worsening existing inequities.

Kufakwababa points out that another of the major challenges in adoption and effective use of AI in the legal sector is that legal work is not entirely done by lawyers; 'part of it is controlled by government and is often created by statute',[65] meaning that the potential for legal services to be done faster, more cost-effectively or efficiently, with the aid of AI, will not be met unless there is willingness on the part of government, the judiciary, and the myriad administrative channels through which legal work is done to learn about and embrace AI technologies, if not simply to accommodate them or at least not to get in the way of innovation and progress.

At the same time, on this continent and elsewhere in the developing world, endemic infrastructural problems and resource constraints make a technology-driven legal system look like something more reflective of science fiction than fact. It is hard to take concepts like AI seriously as a real disruptor of the system when that system includes courts that lack access to basic resources such as the Internet, mobile networks or even an uninterrupted electricity supply. It's even harder to promote futuristic legal tech solutions that promise to bring access to justice to the general population in Africa when one considers that the internet penetration rate is only 43.1% as at 2021 data.[66] Moreover, equity gaps in access to the Internet add a sinister layer of injustice to the picture, and the fact that most AI tools originate in the Global North brings the spectre of colonial dominance with it. The conclusion seems inescapable that, in many African contexts, the promised benefits of legal tech will likely be available only to an already socio-economically privileged minority.

Finally, there is the challenge of improving awareness and understanding of how AI works and how it can be used to make legal work more efficient, and assuaging the fears among lawyers who resist the disruptive force of AI on the basis that it will change the status quo and obviate the need for human lawyers to perform certain tasks that they regard as their bread and butter. There is a need to convince the industry that it is in their interests to incorporate AI as an aid which can automate tedious tasks, make their work easier and faster, and allow them to deliver a better service to their clients, and that AI is nowhere near advanced enough to pose a threat as a replacement for, or a competitor to, flesh-and-blood lawyers. The real competitive threat comes, therefore, from the lawyers at competing firms who are quicker to adopt and leverage AI in their own favour. Moreover, some legal applications, particularly those for Contract and document review, still require people to train the AI on contractual models (usually hundreds of agreements) and reviewers are also required to validate the output and train tools like Kira and Relativity as their output is never 100% accurate. Hence, the human lawyer is not likely to be dispensed with so soon as some fear.

65 Kufakwababa at 11.
66 Internet World Stats: 'Africa'.

In the South African case of *Michelle Parker v Amanda Forsyth & Others*,[67] the Plaintiff's attorney had forwarded a list of cases it sought to rely on to the defendants (and not the court), who had a synopsis of the cases as authorities on various points of law raised that were sourced from ChatGPT. The court berated the carelessness and laziness of the attorneys for using AI to conduct legal research without confirming its accuracy as the cases turned out to be fictitious and non-existent. The court therefore warned of the need to still infuse independent reading, reasoning and check the use of technology. Human intervention and supervision are, therefore, still very much needed in the use of AI in legal processes, practice and systems in order to ensure fairness, justice, transparency, veracity and effectiveness.

The outcomes of continued proliferation of AI in the legal sector and legal business in Africa will depend on a number of factors, some of which are likely yet to be discovered. Among these factors are the policy responses of governments, the cultivation and development of localised innovations, and the attitudes of the profession and the judiciary towards the inclusion of AI solutions in their everyday work. Whatever these changes may be, we are advised by Susskind to keep our eye on the horizon and prepare for it as cleverly as we can; not to succumb to fear or analysis paralysis, but rather to be excited about the pioneering spirit of the times. 'Wayne Gretzky, perhaps the finest ice hockey player of all time, famously advised to "skate where the puck's going, not where it's been"', he writes. 'Similarly, when lawyers are thinking about the future, whether about their law firms or law schools, they should be planning for the legal market as it will be and not as it once was.'[68]

11.6 References

Adeyoju, A 'Artificial Intelligence and the Future of Law Practice in Africa' (15 December 2018) SSRN: <https://ssrn.com/abstract=3301937> and <http://dx.doi.org/10.2139/ssrn.3301937>.

Agunbiade A *Artificial Intelligence and Law: A Nigerian Perspective* (Lap Lambert Academic Publishing, 2019) <https://www.academia.edu/40338183/Artificial_Intelligence_and_Law_A_Nigerian_Perspective>.

Ajayi J 'Artificial Intelligence in the Nigerian Legal Industry: A Threat or an Opportunity?' (12 April 2020) <SSRN: https://ssrn.com/abstract=3574324> and <http://dx.doi.org/10.2139/ssrn.3574324>.

Angwin J, Larson J, Mattu S & Kirchner L 'Machine Bias' (23 May 2016) <https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing>.

Baginski K 'Legal Analytics and Artificial Intelligence for Research & Law Practice: Tools, Features & Functionality' (2019) <https://www.duq.edu/assets/Documents/law/legal-research/_pdf/Baginski,%20Lexis.pdf>.

CaseLines: 'CaseLines 15 Minute' https://www.youtube.com/watch?v=EUzJa1W4ak8 (accessed 16 January 2022).

67 Case No: 1585/20, 29 June 2023 (Regional Court for the Regional Division of Gauteng, Johannesburg).

68 Susskind *Tomorrow's Lawyers* at xxii.

CDS: 'The Basics: What is e-Discovery?' <https://cdslegal.com/knowledge/the-basics-what-is-e-discovery/>.

Davis AE 'The Future of Law Firms (and Lawyers) in the Age of Artificial Intelligence' <https://www.americanbar.org/groups/professional_responsibility/publications/professional_lawyer/27/1/the-future-law-firms-and-lawyers-the-age-artificial-intelligence/>.

Eguivant: FAQ: <https://www.equivant.com/faq/> (accessed 2 March 2022).

European Parliament: 'EU AI Act: first regulation on artificial intelligence' <https://www.europarl.europa.eu/news/en/headlines/society/20230601STO93804/eu-ai-act-first-regulation-on-artificial-intelligence#:~:text=In%20April%202021%2C%20the%20European,mean%20more%20or%20less%20regulation>.

Gwagwa A, Kraemer-Mbula E, Rizk N, Rutenberg I & De Beer J 'Artificial intelligence (AI) deployments in Africa: Benefits, challenges and policy dimensions' *The African Journal of Information and Communication (AJIC)* (2020) 1-28 <https://doi.org/10.23962/10539/30361> (Gwagwa et al.).

Gwagwa AE 'Artificial Intelligence adoption and use cases in Africa' (2019) <https://www.academia.edu/42070923/Artificial_Intelligence_adoption_and_use_cases_in_Africa> (Gwagwa).

Himonga C, Taylor M and Pope A 'Reflections On Judicial Views Of Ubuntu' *PER* (2013) 67 <https://www.saflii.org/za/journals/PER/2013/67.html>.

IBM: 'What is Natural Language Processing?' (2020) <https://www.ibm.com/cloud/learn/natural-language-processing>.

Internet World Stats: 'Africa' <https://www.internetworldstats.com/africa.htm#:~:text=601%2C643%2C061%20Internet%20users%20in%20Africa,%2C%20with%2043.1%25%20penetration%20rate>.

Judiciary of Uganda: 'Judiciary Launches ECCMIS' (2022) <http://judiciary.go.ug/data/news/1083/5040/Judiciary%20Launches%20ECCMIS.html>.

Kamga SD 'Cultural values as a source of law: Emerging trends of ubuntu jurisprudence in South Africa' 18 *African Human Rights Law Journal* (2018) 625–649.

Kempe G 'What Government and the Law can Learn from Cloud Computing's Success' (2019) <https://laws.africa/2019/02/14/govt-law-cloud-computing.html> (accessed 2 March 2022).

Kenya Law: 'Practice Directions on Electronic Case Management' (2020) <http://kenyalaw.org/kl/index.php?id=10211>.

Kufakwababa CZ 'Artificial intelligence Tools in Legal Work Automation: The Use and Perception of Tools for Document Discovery and Privilege Classification Processes in Southern African Legal Firms' (2021) <http://hdl.handle.net/10019.1/109893>.

Land Portal: 'The private Mailo tenure system' <https://www.landportal.org/library/resources/ private-mailo-tenure-system>.

Legal ML 'JP Morgan COIN: A Bank's Side Project Spells Disruption for the Legal Industry' (13 November 2018) <https://digital.hbs.edu/platform-rctom/submission/jp-morgan-coin-a-banks-side-project-spells-disruption-for-the-legal-industry/>.

LegalMart: 'How is AI transforming Contracts?' <https://www.linkedin.com/pulse/how-ai-transforming-contracts-legamartlegal/>.

Jacob K, Schindler D & Strathausen R *Liquid Legal: 'Towards a Common Legal Platform* (Springer, 2020)

Mayson SG 'Bias In, Bias Out' Faculty Scholarship at Penn Law. (2018) <https://scholarship.law.upenn.edu/faculty_scholarship/2393>.

McNerney J. 'How Africa's Courtrooms Became As Advanced As Anywhere In The World' (2019) <https://www.artificiallawyer.com/2019/04/05/how-africas-courtrooms-are-embracing-legal-technology/> (accessed 16 January 2022).

Muhamba V 'US firm wins US$3 mil tender to deliver case management system to JSC' (2020) <https://www.techzim.co.zw/2021/02/us-firm-wins-us3-mil-tender-to-deliver-case-management-system-to-jsc/>.

Murungi E and Tusime T 'Covid-19: Why an Electronic Case Management System is a Necessity in Uganda' (2020) <https://www.bowmanslaw.com/insights/covid-19-law-and-technology-why-an-electronic-case-management-system-is-a-necessity-in-uganda/>.

Ochojila A 'Examining the workability of virtual trial in Nigeria' (2020) <https://guardian.ng/features/law/examining-the-workability-of-virtual-trial-in-nigeria/>.

Open Definition: 'Defining Open in Open Data, Open Content and Open Knowledge' <http://opendefinition.org/>.

OpenNyAI: 'Benchmarks for Indian legal NLP'. https://opennyai.org/initiatives/benchmarks-for-indian-legal-nlp/> (accessed 2 March 2022).

Opensource.com: 'What is open source?' <https://opensource.com/resources/what-open-source> (accessed 2 March 2022).

Quora: 'Is the DoNotPay app a legitimate app that is safe and effective to use?' <https://www.quora.com/Is-the-DoNotPay-app-a-legitimate-app-that-is-safe-and-effective-to-use>.

Rich B 'How AI Is Changing Contracts' <https://hbr.org/2018/02/how-ai-is-changing-contracts>.

Ryan M 'Donotpay Reviews: Is Donotpay Legit As A Legal Tech Platform Or Scam?' <https://michaelryanmoney.com/donotpay-reviews-is-donotpay-legit-review/#:~:text=User%20Experiences%20with%20DoNotPay,and%20the%20quick%20results%20provided>.

South Africa: Judge President's Practice Directive 1 of 2021 <https://www.judiciary.org.za/images/news/2021/Judge_Presidents_Practice_Directive_1_of_2021_Case_Management_and_Enrolment_of_Civil_Trials_in_the_Gauteng_Division_of_the_High_Court.pdf>.

South African Judiciary: Court Online: <https://www.judiciary.org.za/index.php/court-online<https://www.judiciary.org.za/index.php/court-online>.

Susskind R *Online Courts and the Future of Justice* (Oxford University Press, 2019).

Susskind R *Tomorrow's Lawyers: An Introduction to Your Future* (Oxford University Press, 2023).

Susskind RE *Expert Systems in Law: A Jurisprudential Inquiry* (Clarendon Press, 1989).

Synergy International Systems: 'Factsheet' <https://www.synisys.com/wp-content/uploads/2021/04/Synergy-Case-Management-System_Factsheet.pdf>.

Synergy International Systems: 'Judiciary of Uganda Commissions the Electronic Court Case Management Information System' <https://www.synisys.com/the-judiciary-of-uganda-commissions-the-electronic-court-case-management-information-system/>.

Synergy International Systems: 'Lesotho Court Case Management System' <https://www.synisys.com/impact/featured-projects/case-management-system-lesotho/>.

Synergy International Systems: 'Rwanda's Justice Sector Integrated Electronic Case Management System' <https://www.synisys.com/impact/featured-projects/rwandas-justice-sector-integrated-electronic-case-management-system/>.

Synergy International Systems: 'Uganda Electronic Case Management Information System Project Inception Workshop' <https://www.synisys.com/uganda-electronic-case-management-information-system-project-inception-workshop/>.

Trust Pilot: 'DoNotPay' <https://www.trustpilot.com/review/donotpay.com>.

Truter C 'Bowmans among the First in Africa's Legal Market to Invest in Artificial Intelligence' (14 May 2018) <https://www.bowmanslaw.com/press_releases/bowmans-invests-in-artificial-intelligence/>.

UN: 'Universal Declaration of Human Rights' <https://www.un.org/en/about-us/universal-declaration-of-human-rights> (accessed 6 March 2022).

UN Statistics Division: 'SDG Indicators' <https://unstats.un.org/sdgs/metadata/?Text=&Goal=16&Target=16.3> (accessed 6 March 2022).

Verster J 'Former office of the chief justice officials accused of benefiting from R225m IT contract -report' News 24 (12 June 2022) <https://www.news24.com/news24/southafrica/news/ former-office-of-the-chief-justice-officials-accused-of-benefiting-from-r225m-it-contract-report-20220612>.

Villata S, Araszkiewicz M, Ashley K et al. 'Thirty years of artificial intelligence and law: the third decade' *Artificial Intelligence Law* 30 (2022) 561–591 <https://doi.org/10.1007/s10506-022-09327-6>.

Vos, Sir Geoffrey 'The Future for Dispute Resolution: Horizon Scanning' The Society of Computers and Law, Sir Brian Neill Lecture 2022 (17 March 2022).

Webber Wentzel: 'Webber Wentzel deploys Luminance's artificial intelligence platform in South Africa' (9 April 2018) <https://www.webberwentzel.com/News/Pages/webber-wentzel-deploys-luminance-s-artificial-intelligence-platform-in-south-africa.aspx>.

Chapter 12

Artificial intelligence and legal ethics in Africa: Forcing uncomfortable decisions

12.1 Introduction

In this chapter, we consider what the widespread use of artificial-intelligence (AI) tools will mean for the rules that govern legal ethics in African countries. By 'AI tools' we mean tools that use machine learning (ML), generative AI and deep learning techniques to create outcomes. We begin our study by examining the key patterns that can be seen in the culture and rules underlying legal ethics in African countries. We identify these patterns by assessing a cross section of countries including South Africa, Zambia, Kenya, Uganda, Nigeria, Ghana and Egypt. Starting from these patterns, we then consider the (a) opportunities and (b) challenges that AI tools will create for legal ethics in African countries. We conclude with a call on those tasked with reviewing the architecture of legal ethics in these countries to take steps to prepare the profession for changes that are bound to arrive.

12.2 Legal ethics in Africa

Legal ethics refers to a set of principles and values which combined with rules of conduct and laws, regulate the legal profession. It captures both the wider moral principles of the legal profession and the specific rules and regulations that govern legal conduct.[1] Lawyers are required to abide by these rules for two key reasons. First, being a member of the legal profession provides economic, intellectual, and other benefits. Their interest in these benefits obliges them to commit to the obligations imposed by rules of legal ethics.[2] Second, upon admission to the bar lawyers usually commit to abide by the regulations of the legal profession.[3] It is also in the public interest for lawyers to abide by a code of ethical conduct since unethical lawyers pose a threat to the very fabric of the rule of law, constitutional values, and the administration of justice for both their clients as the community interests as a whole.[4]

The rules of legal ethics in Africa bear significant resemblance to those in Western countries. This is very likely a result of the forceful imposition of Dutch, Roman, and English legal norms through colonial violence.[5] The character of these laws is a combination of both civil and common-law traditions as they combine two kinds of drafting

1 Van Zyl CH IV and Visser J-M 'Legal Ethics, Rules of Conduct and the Moral Compass – Considerations from a Law Student's Perspective' at 6.
2 Stier S 'Legal Ethics: The Integrity Thesis' at 591.
3 Ibid.
4 Robertson M and Kruuse H 'Legal ethics education in South Africa: possibilities challenges and opportunities' at 345.
5 Mnyongani F 'Whose morality? Towards a legal profession with an ethical content that is African' at 123.

styles. Legal ethical rules combine both the drafting of concrete legal rules as broad principles used to guide lawyers in the use of their discretion.[6]

From the outset, it is apparent that there are some common features underpinning the framework for legal ethics in Africa. These rules usually find their basis in the various statutes instituted in whichever country one has in question. The statutes are often supplemented by subsidiary legislation such as advocates' rules or professional and ethical codes and standards. These codes play a large role in helping to develop and sustain high moral standards among lawyers.[7] These professional and ethical standards are in turn enforced by statutory bodies such as the Law Society of Kenya, the General Legal Council in Ghana, the Law Society of Uganda, the South Africa Legal Practice Council, the Egyptian Bar Association, Law Association of Zambia and the General Council of the Bar in Nigeria.[8]

For the purposes of this chapter, we selected seven jurisdictions as case studies: Egypt, Kenya, Uganda, Nigeria, Ghana, Zambia and South Africa. We sought to investigate the common features they have in relation to qualifications to become a legal practitioner, ethical and professional standards required of a legal practitioner as well as rules around misconduct.

12.3 Cross cutting themes in legal ethical rules around Africa

12.3.1 *High quality of services*

Legal and professional ethics rules in Africa aim to ensure that clients achieve the highest standard of legal services. These rules do so in the following ways. First, legal ethics codes prescribe the highest quality of legal services to clients. South African codes provide that legal practitioners are required to conduct themselves with the degree, skill, care, attention and quality required of a practitioner.[9] Ghanaian law goes even further by making provisions for judges to make complaints to the general legal council where the submissions of lawyers are not up to the required quality.[10] In a similar manner, Kenyan laws provide for submission of complaints to a disciplinary committee where a legal practitioner's conduct is not of the expected quality.[11]

To ensure that there is no deviation from the high quality of services, legal ethics rules put in place certain measures to bar those who cannot attain this high standard from practicing and provide sanctions for unlawful practice. Zambian laws provide that those who cannot attain the standard set for admission to the roll of advocates are barred from setting up a legal practice and appearing before the Supreme Court.[12] Ghanaian laws' penalty for practicing without being enrolled is liability for conviction of

6 Karnavas MG *Lawyer's Ethics* at 8.
7 Nicolson D 'Making lawyers moral? Ethical codes and moral character' at 605.
8 Law Society of Kenya Act No. 21 of 2014 s 3; Legal Profession Act No. 32 of 1960 (Ghana) s 1; Uganda Law Society Act 1970 s 3; Legal Practice Act No. 28 of 2014 (South Africa) ss 37 and 38; Advocates Law No. 197 of 2008 (Egypt); Law Association of Zambia Act No. 36 of 1973 s 1; Legal Practitioners Act 1975 (Nigeria) s 3.
9 Code of Conduct for All Legal Practitioners, Candidate Legal Practitioners and Juristic Entities *GG* No. 40610 of 10 February 2017 (South Africa) (Code of Conduct SA) Code 18.14 at 701.
10 Dawuni JJ 'The legal profession in Ghana: from indigenization to globalization' at 20.
11 Advocates Act No. 12 of 2012 (Kenya) s 60A.
12 Legal Practice Act No. 28 of 2014 s 13A.

a fine and for an offence committed after conviction imprisonment and a fine.[13] Ugandan laws impose strict fines for those who practice without being qualified.[14]

Finally, legal ethics ensures maintenance of high quality of work through postulating the legal duties lawyers are bound to fulfil to their clients. These duties are cross-cutting in nearly all the jurisdictions studied. First and foremost, legal ethics provides that lawyers have a duty of competence towards their work and their clients. The Ghanaian law provides that lawyers must provide competent representation to their client in terms of skills, thoroughness, knowledge, and preparation.[15] The South African code of conduct provides that lawyers are required to use their best efforts to carry out their work in a competent manner and if they do not reasonably believe they can do so, they should not take on the task.[16]

Secondly, professional ethics ensure that information disclosed by clients of legal services remains confidential by obliging lawyers to abide by their duty of confidentiality. Zambian, Ugandan and Ghanaian codes all contain this duty by providing that lawyers are obliged to keep client information confidential. The only exception to this duty is the disclosure of information if the client consents to the disclosure as the disclosure is necessary and is permitted by law or by a court order.[17]

A lawyer has an obligation to disclose all relevant information to their clients. This ensures that their clients are not prejudiced by information that is not within their knowledge.[18] Zambian law provides that practitioners have a duty not to deceive or mislead their clients or allow them to be misled. This entails the legal practitioner revealing all information that is relevant to the client's case.[19] Ugandan codes makes provision that lawyers are required to disclose the fact that they are unqualified to practice by being struck from the advocates' roll.[20] Other duties that bind lawyers include the duty of confidentiality, the duty to avoid conflict of interests,[21] and the duty to act in good faith with honesty and integrity.[22]

12.3.2 *Action against misconduct*

Legal ethics prioritises discipline in the legal profession by providing for a system to handle misconduct. It places punishment and sanctions for misconduct by advocates. The most common and cross-cutting form of punishment is the removal of an advocate's name from the advocates roll especially in cases of professional misconduct, judgment of a disciplinary committee and institution of civil or criminal proceedings.[23]

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13 Legal Profession Act No. 32 of 1960 s 9.
14 Advocates Act 1970 (Uganda) s 64.
15 Legal Profession (Professional Conduct and Etiquette) Rules 2020 (Ghana) r 6.
16 Code of Conduct SA Code 3.11 at 691.
17 Legal Profession (Professional Conduct and Etiquette) Rules 2020 r 19; Legal Practitioners (Practice Rules) 2002 rr 34(2) and 35(2); Advocates (Professional Conduct) Regulations 2014 r 7.
18 Legal Profession (Professional Conduct and Etiquette) Rules 2020 r 61.
19 Legal Practice Act No. 28 of 2014 s 52(h).
20 Advocates Act 1970 s 73.
21 Standard of Professional Practice and Ethical Conduct 2016 Standard 6.
22 Ibid. Standard 12; Code of Conduct SA Code 59.1 at 731; Rules of Professional Conduct for Legal Practitioners 2007 r 27.
23 Legal Profession Act No. 32 of 1960 s 16(1); Legal Practice Act No. 28 of 2014 s 53; Advocates Act 1970 s 10.

This ensures the removal of lawyers who would otherwise engage in actions that are detrimental to their clients, affecting the overall quality of the legal profession.[24] Other punishments for misconduct include the admonition of advocates, suspension from practice, and the payment of a fine or compensation.[25]

Legal ethics in Africa establishes means of policing ethical rules and standards and handling misconduct. This is done in three main ways: First, the establishment of investigative and disciplinary committees and commissions that handle complaints about the quality of submissions, professional misconduct and the misbehaviour of an advocate.[26] A second means used to police the enforcement of legal ethics is the use of pre-existing bodies to monitor legal ethics and legal services such as law societies as is done in Kenya, Nigeria and Uganda.[27] Last but not least, certain countries establish a specific body tasked with monitoring legal ethics and the quality of legal services such as the General Legal Council in Ghana.[28] Ultimately, these bodies ensure that lawyers are professionally regulated, the legal profession maintains its standards and clients receive the best legal services.

12.4 Opportunities for artificial intelligence

Legal technology is being embraced in the African continent with the use of advanced technology such as AI and blockchain. Legal Tech in Kenya has introduced an AI chat box known as Artemis Legal AI which provides accurate and up-to-date information on Kenyan case law and legal information.[29] Legal Naija has introduced TIMI, a chat box that provides consultancy for legal practitioners.[30] Moreover, Andersen law, a prominent tax firm in Egypt utilises AI to increase their efficiency and effectiveness in their legal and tax practice.[31]

In this chapter, we explore opportunities for AI in legal ethics. We take AI to be the capability of machines to imitate intelligent human behaviour. It involves teaching computers how to perform tasks that are ordinarily performed by humans.[32] AI systems display some form of intelligent-like behaviour as they analyse their environments and make decisions based on them with limited autonomy.[33] These systems mimic human behaviour such as recognising speech, making decisions and translation

24 Dawuni at 20.

25 Advocates Act No. 12 of 2012 s 60; Legal Profession Act No. 32 of 1960 s 16(1); Advocates Act 1970 s 20(4).

26 Legal Profession Act No. 32 of 1960 s 18; Law Society of Kenya Act s 4; Advocates Act 1970 s 19; Legal Practice Act No. 28 of 2014 ss 37 and 38; Advocates Act No. 12 of 2012 s 53.

27 Advocates Act No. 12 of 2012 s 57; Uganda Law Society Act 1970 s 3.

28 Legal Profession Act No. 32 of 1960 ss 1, 18 and 23; Dawuni at 91.

29 See Artemis Legal AI: Legal Technology Kenya <https://www.legaltechkenya.com/artemis>.

30 See Timi, the AI Companion For Every Young Lawyer; and Legal Naija: Search of Lawyers <https://legalnaija.com/timi-ai-companion-for-every-young-lawyer/02900951941647681314/.

31 Iskander MM 'Egypt: Pioneers In Integrating Artificial Intelligence To Enhance The Efficiency Of Lawyers And Tax Professionals'.

32 Cerny J, Delchin S and Nguyen H 'Legal Ethics in the Use of Artificial Intelligence' at 2.

33 Boucher P 'Artificial intelligence: How does it work, why does it matter, and what can we do about it' at 1.

of languages.[34] We also use AI to describe generative AI technology which produce various types of content such as ChatGPT by Open AI and Bard by Google.[35]

12.4.1 *Enabling higher quality legal services*

AI systems work in two main ways: AI systems are fed with data and these systems analyse and use those data to make decisions; or more advanced systems learn from their own trial and error.[36] AI is being used in the legal field to improve productivity and the quality of legal services given to clients. This part focuses on the use of AI in e-discovery and predictive coding, litigation analysis, and contract review and management.

AI systems can ease the process of e-discovery by using predictive coding. Discovery is a process of ascertaining what relevant information and documentation on a matter exist so that no party is caught off guard during a legal proceeding. The technological revolution has resulted in many documents – correspondence created, transmitted and signed digitally. E-discovery is the discovery of electronically stored information (ESI)[37] and involves seeking, locating, securing, and searching for documents to use in cases whether criminal or civil.[38] Using predictive coding, AI systems can classify documents as relevant, irrelevant, or anything relevant.[39] Systems such as the Electronic Discovery Reference Model helps a legal organisation to choose suitable e-discovery tools, determine the necessary skills needed to use these tools, and documentation of the process for accountability purposes.[40] The use of these systems enables law firms to ease the discovery process and to reduce the costs of production, redaction, and review of millions of documents relevant to a trial.[41] These systems have been used extensively in the United States where litigation involves substantial amounts of discovery.[42]

AI systems can be effective in litigation since their use includes predictive analysis of legal disputes. Predictive analysis is a process that uses large volumes of data to forecast potential outcomes in particular legal cases.[43] This is done through inputting previous decisions to predict future cases.[44] It examines how judges and courts make decisions on various cases and then aims to predict the possible outcome of other cases.[45]

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34 Donahue L'Primer on Using Artificial Intelligence in the Legal Profession' at 8.
35 ChatGPT: <https://openai.com/blog/chatgpt>; Bard: <https://bard.google.com>.
36 Yamane N 'Artificial Intelligence in the Legal Field and the Indispensable Human Element Legal Ethics Demands' at 878.
37 Cassim F 'The use of electronic discovery and cloud-computing technology by lawyers in practice: Lessons from abroad' at 20.
38 Conrad JG 'E-Discovery revisited: the need for artificial intelligence beyond information retrieval' at 321.
39 Deloitte: 'Artificial intelligence and machine learning in e-discovery and beyond: Driving efficiencies in e-discovery using AI' at 3.
40 Deloitte: 'The future of eDiscovery: The vital role of EDRM' at 4.
41 International Trademark Association Committee Report: 'The Use of Artificial Intelligence in Trademark Proceedings' at 1.
42 *United States of America et al. v Education Management LLC et al.* (2013) United States District Court para. 142.
43 Rigano C 'Using Artificial Intelligence to Address Criminal Justice Needs' at 7.
44 Goodman CC 'AI/ESQ: Impacts of Artificial Intelligence in Lawyer-Client Relationships' at 152.
45 Lim D 'Predictive Analytics' at 161.

Analytical AI can also be used to evaluate the success rates for lawyers when appearing with particular judges and opposing counsel. The objective of analytical AI is to forecast a particular lawyer's success rate in particular courts. It can also forecast arguments that can be made by the opposing counsel and the strengths of the prepared written agreements.[46] This will improve the quality of legal services given to their clients as it will help lawyers in making better decisions and giving better advice.[47]

AI systems enhance the process of contract review and management – a task previously done by humans. AI reads contracts more accurately despite the format, provides analytics of the data, and extracts contracts much faster than a talented team of lawyers could.[48] It does so using three main ways: recognition and tagging important clauses and legal concepts, detecting omissions, anomalies, incorrect additions, and categorising contracts according to their specifications.[49]

Studies done by companies such as Kira Systems show that leveraging AI cuts down the time of contract review and management by 60%.[50] This allows for the saved time to be better spent in strategic planning, optimising the process, and accelerating the closing of a deal and, in so doing, enhancing the quality of legal service.[51]

Therefore, the use of AI improves the quality of legal services as it reduces the time needed to complete tasks and, additionally, completes the tasks more efficiently than a human would. These systems perform analyses at a level that are beyond human reach.[52] They 'think' like humans but much more effectively[53] and free lawyers of the 'mechanical' tasks that consume precious time allowing them to focus on their humanitarian and ethics skills to enhance their legal services more effectively.[54] Generative AI is grounded on material found in a law firm's precedents database: record-management systems that ensure the creation of quality content with simple prompts from the end user. It can produce powerful and almost instantaneous content.[55]

Moreover, AI systems also perform tasks usually done by humans more accurately. Using the example of predictive analysis again,[56] humans are bound by cognitive limitations and assured rationality that result in biases and heuristics. ML tools, on the other hand, find patterns in copious amounts of data and can assemble and apply that information in a much shorter time and more accurately.[57] AI systems also allow lawyers to check their work easily increasing the accuracy of legal advice.[58]

AI systems can likewise be used by the bodies that police ethical violations to identify violations of legal ethics more efficiently. This can be done through the process of predictive policing, which is based on the process of predictive analysis that utilises

46 Goodman at 152.
47 Donahue at 4.
48 Yamane at 881.
49 Aslan E: 'AI boosts contract analysis' *ABA Law Technology Today* (April 2019) at 5.
50 Kira Systems: 'How Law Firms Leverage Kira's AI to Cut Contract Review Time by Up to 60%' at 3.
51 Unitedlex: AI-Driven Commercial Contract Review at 2.
52 Davis JP 'Law without mind: AI, Ethics and Jurisprudence' at 174.
53 Ibid. at 176.
54 Legg M and Bell F 'Artificial Intelligence and the Legal Profession' at 36.
55 Thomson Reuters: CaseLines: An introduction to the Evidence Sharing Platform at 14.
56 Legg and Bell at 36.
57 Ibid.
58 Yamane at 882.

substantial amounts of data to predict possible outcomes.[59] Predictive policing has been utilised in the criminal justice field to identify possible crimes, perpetrators, and the geographical locations these crimes will take place. It uses algorithmic processes to predict what the odds are for certain individuals to commit illegal actions.[60] Researchers use these technologies to determine factors (social, economic, demographic etc.) that could induce a person to commit a violation.[61] This means that research can be based and the systems trained on collected data from past violations of ethical rules to enable the bodies that police legal ethics to identify factors that could induce a person to commit an ethical violation, persons who are most likely to commit such violations, and in what settings these violations may occur.

12.4.2 *Policing the conduct of lawyers*

Additionally, policing bodies can use AI systems to monitor the behaviour of lawyers. This monitoring can be through signature-based approaches that involve a pattern considered against observed behaviours in particular areas of interest.[62] Using this method, policing bodies can use patterns of previous ethical violations to monitor the behaviour of lawyers. Alternatively, anomaly-based approaches can be used. This approach uses ML to observe the behaviour of a specific group and identify common patterns and anomalies in the behaviour of some members in the group.[63] Policing bodies can apply this approach by using ethical behaviour as the behaviour of the group and unethical behaviour as the anomalies in the group.

The ethical issues faced by lawyers in the use of AI are not entirely novel as they affect common duties such as competence, confidentiality, and supervision.[64] At the same time, AI assume specific legal duties and the kinds of services that will be offered to clients and, as such, lawyers must be able to adapt to these changes. This includes identifying the systems that are relevant to your practice and understanding how to use them to improve the quality of services given to clients.[65] Furthermore, legal ethics rules and codes of conduct were not formulated with the intricacies of AI and legal ethics in mind. As a result, lawyers may have to update their various codes of conduct and legal rules to adapt to current trends in the legal regime.[66] Nevertheless, certain rules were formulated to be adaptable for modern times.[67] Such rules can be used to streamline the use of AI in legal matters with legal ethics.

A concern that arises from using AI in predictive policing is the capability for prejudice. AI systems run based on the data which they are trained. These data set direct algorithms on what the correct output should be about people or objects in certain circumstances. In cases where this data is biased or reflects some prejudices this promotes social disparities. Human bias can be unintentionally transposed into AI systems during their development.[68] Considering the fact that many ML and AI models

59 Rigano at 8.
60 Macnish K, Wright D and Jiya T 'Predictive Policing in 2025: A Scenario' at 201.
61 Ibid. at 202.
62 Javadi et al. 'Monitoring AI Services for Misuse' at 600.
63 Ibid.
64 Lat D 'The Ethical Implications of Artificial Intelligence' at 2.
65 Legg and Bell at 58.
66 Yamane at 883.
67 Ibid.
68 CIPIT: 'State of AI in Africa 2023 Report' at 11.

are built and trained in developed countries these may use data that is not recognised or that reflects biases and prejudices.[69] Its use in legal-ethics enforcement could result on bias against certain demographics.[70]

While the use of AI creates a myriad of opportunities for legal practitioners in Africa, the reality is that most of these AI systems are limited to larger firms with larger and even in some instances international scopes.[71] Systems such as CaseLines are therefore more accessible to all firms. CaseLines is a cloud-based digital document and evidence-sharing platform that allows the court to create a digital case and parties can upload, review and present case documents.[72] Legal practitioners are invited to file court papers online and court appearance is conducted through digital teleconferences.[73] CaseLines was adopted in South Africa in January 2020 following a directive from the judge president.[74] Other countries such as Rwanda, Kenya, Uganda and Egypt have introduced case-management systems comparable to CaseLines in a bid to promote e-filing.[75]

12.5 The challenges that AI presents for legal ethics in Africa

Notwithstanding the myriad of opportunities AI presents for legal ethics in Africa, this does not come without its own set of challenges. We analyse the challenges that AI presents for Africa in two respects. First, we analyse some of the general challenges affecting the implementation of AI in legal ethics in Africa; then we look at how it affects the specific duties lawyers owe to their clients.

12.5.1 *Lack of adequate infrastructure*

Some African countries lack necessary technological infrastructure required for the implementation of AI systems. This includes a lack of the adequate technical equipment and connectivity required to operate AI systems as well as the presence of available and sufficient data ecosystems.[76] Digital infrastructure includes the internet, internet-based data bases and data tools, software, computers, internet-embedded smartphones and tablets, geolocation systems and digital platforms.[77]

In regard to internet connectivity, countries such as Egypt and South Africa have higher rates of internet connectivity at 72.2% and 72.3% respectively while countries such as Nigeria and Kenya have lower rates of 55.4% and 37% internet connectivity as

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69 Ade-Ibijiola A and Okwonkwo C ‘Artificial intelligence in Africa: Emerging Challenges’ at 107.

70 Nigerian Communication Commission: ‘Ethical and Societal Impact of Artificial Intelligence’ at 11.

71 Kufakwababa CZ ‘Artificial intelligence tools in legal work automation: The use and perception of tools for document discovery and privilege classification processes in Southern African legal firms. at 9.

72 Thomson Reuters: CaseLines: An introduction to the Evidence Sharing Platform at 2.

73 Mabeka NQ ‘An Analysis of the Implementation of the CaseLines System in South African Courts in the Light of the Provisions of Section 27 of the Electronic Communications and Transactions Act 25 of 2002: A Beautiful Dream to Come True in Civil Procedure’ at 15.

74 Judge President’s Practice Directive, Directive 1 of 2020 <https://www.ppv.co.za/wp-content/uploads/2020/01/Judge-President’s-Practice-Directive-1-of-2020.pdf> (accessed 3 July 2020).

75 Africa Law Tech: ‘An analysis of virtual courts in Africa’ at 12.

76 CIPIT at 5.

77 World Bank Group: *Digital Africa: Technological Transformation for Jobs* at 1.

of January 2023.[78] Other digital technologies required are not accessible to all. Reports from the implementation of virtual courts during the Covid-19 pandemic highlight that for those in rural areas, there were challenges with access to devices used to access e-filling and virtual court sessions as well as low internet connectivity and high cost of internet.[79] Lawyers in such areas are in effect barred from accessing and utilising AI systems as they lack the proper digital infrastructure.

Additionally, there is a lack of a structure data ecosystem which affects the overall digital infrastructure necessary for the use of AI. AI systems rely more on the quantity and quality of data to provide accurate outputs in every given situation.[80] The product of any AI system is more dependent on the datasets that are fed to the algorithm as opposed to the actual algorithm itself.[81] AI systems could fail if the data used to design them is not an accurate reflection of the demographic of the target population.[82]

Africa has been described by some as a data desert. This term has been used in the past to describe the perceived absence of data in African countries.[83] Some scholars like Rutenberg, Gwagwa and Omino argue that this statement is not entirely a true depiction of the situation in most African countries. They argue that it is more accurate to say that data is not as readily available and searchable.[84] Many governments in Africa do not keep their websites updated with current information[85] and the concept of open data is not as widespread as other parts of the world. In some instances, datasets are sold to create revenue and as such there is no incentive to promote open data contributing to the overall inadequacy of data.[86]

Many countries in sub-Saharan Africa have a low ranking in terms of providing meaningful access to important public data.[87] Kenya and South Africa have put significant efforts to improve and implement open data with both countries ranking 35th and 46th in the global open-data barometer.[88] The United Nations Economic Commission on Africa has described the data ecosystems in Africa as being in the nascent stages of the data revolution.[89] This data divide affects the implementation of AI systems as these systems do not accurately reflect the needs of lawyers within the African continent.

Will bodies that regulate legal ethics have the necessary infrastructure to utilise AI systems to regulate legal ethics? Additionally, as most of these organisations are established and funded by the state do they have the necessary financial capacity to acquire this infrastructure?

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78 GSMA: 'State of Mobile Internet Connectivity 2021 Report' at 17.
79 Africa Law Tech at 12.
80 Ade-Ibijiola and Okwonkwo at 106.
81 Rutenberg I, Gwagwa A and Omino M 'Use and Impact of Artificial Intelligence on Climate Change Adaptation in Africa' at 1109.
82 Ade-Ibijiola and Okwonkwo at 106.
83 Castro D 'The rise of data poverty in America' Centre for Data Innovation (10 September 2014) at 2.
84 Rutenberg, Gwagwa and Omino at 1121.
85 Ibid.
86 Ibid.
87 Adams R 'AI in Africa: Key Concerns and Policy Considerations for the Future of the Continent' at 10.
88 Open Data Barometer: 'Sub-Saharan Africa Regional Snapshot' at 2.
89 UN Economic Commission on Africa: 'The Africa Data Revolution Report 2018: The Status and Emerging Impact of Open Data in Africa' at 4.

12.5.2 *Differences in cultural and legal systems*

The United States has been at the forefront of AI development for a few years now. Countries like China, Canada and a few European countries have also joined the race to develop AI models.[90] While there has been an increase in the number of actors involved in the AI knowledge creation, capacity building and innovation, not many AI models and tools are developed in Africa.[91] Many Africans lack control to the development and ownership of AI models.[92] As a result of this, lawyers are forced to transpose already developed AI tools to use in their law practices; foreign tools that dominate region and offer services that may not be compatible with local priorities.[93]

Africa has diverse populations with different cultures, backgrounds and who speak different languages. The developers of AI tools and systems need to take these diverse circumstances into account to develop ethical and responsible AI systems.[94] Many AI tools that are transposed in Africa are often fed data that does not accurately reflect the culture and practices of the African demographic due to some of the challenges mentioned in the previous sub-section. Such tools are therefore unable to reflect the cultural and political nuances that shape social and political dynamics. Utilising these models is extremely disadvantageous as they may fail to fulfil the intended purpose due to the lack of requisite data.[95] Little has been done to advance unified African positions and approaches in global ethics AI forums. As such, AI systems may not automatically apply in Africa without the necessary adjustments. This raises the question of whether the use of AI systems that are not an accurate reflection of the cultural circumstances in Africa to police legal ethics, does more harm than good.

In a similar manner, most AI legal technologies are developed to run on the American or European legal system which is different from the laws of many African states.[96] They do not accurately reflect the diversities of legal systems in the world. Current legal technology has not been adopted for low-income countries such as those in Africa.[97] This puts lawyers in Africa at a disadvantage as they cannot fully utilise and benefit from these systems. The technologies need to be developed and refined to cater to legal systems in Africa.[98]

12.5.3 *Inadequacy of data-protection regimes*

To promote the growth of responsible AI in Africa, there must be appropriate policies and data-protection laws and policies are at the forefront of promoting the use of AI.[99] The African Union Convention on Cyber Security and Personal Data Protection is one of

90 Stanford University: 'Artificial Intelligence Index Report 2023' at 20–30.
91 CIPIT at 13.
92 : Yeboah K 'Artificial Intelligence in Sub-Saharan Africa: Ensuring Inclusivity' *Paradigm Initiative* at 8.
93 Adams at 7.
94 CIPIT at 5.
95 Ibid. at 6.
96 Kufakwababa at 89.
97 Ibid.
98 Ibid.
99 Gwagwa et al. 'Responsible Artificial Intelligence in Sub-Saharan Africa: Landscape and general state of play' at 16.

the continental laws that apply to the processing of data by AI systems.[100] As a convention that was adopted in 2014, it did not capture some of the salient features of AI and its effects on data protection. Additionally, as of 11 April 2023, Ghana and Zambia have signed and ratified the treaty. Egypt, Kenya, Uganda and Nigeria have neither signed nor ratified the treaty and South Africa has signed but not ratified the treaty.[101]

Within the specific countries, data protection legislation has recently been enacted in Kenya, South Africa, Ghana, Zambia, Uganda, Nigeria and Egypt.[102] These data-protection laws bear a substantial similarity to the provisions of the General Data Protection Regulation.[103] Some countries like Nigeria have even amended their previous laws to reflect harmony with international standards in data protection and privacy.[104]

While the laws are comprehensive, the main challenge faced is compliance and enforcement of the laws. Not only do public enforcement agencies neglect their duty to enforce data-protection laws but several African countries' governments and government organisations also fragrantly violate data-protection laws.[105] Even in cases where enforcement authorities get involved in the prevention of violation of data protection, this regulation may come when the technologies have already caused harm.[106]

AI and data are inextricably linked due to three main mechanisms, namely computing power, the use of complex algorithms, and large volumes of data required to train AI.[107] AI systems rely on large amounts of data to learn and operate effectively.[108] Traditional data-protection laws therefore have to adapt to the realities of AI as it alters the processing, control and access to data.[109] With many data-protection laws in Africa still being at infancy, AI deployment remains largely unregulated[110] and these laws are not capable of providing for strategies that can be used to mitigate the threats caused by AI, especially those that affect data privacy and data protection.[111] Africa's low prioritisation of AI implementation further worsens this situation caused by inadequate data-protection laws.[112]

The current data-protection framework in Africa cannot deal with privacy and confidentiality concerns raised by less-developed systems such as CaseLines.[113] The risks for AI far outweigh that of CaseLines due to the larger amounts of data required and therefore data protection is a huge challenge.

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100 AU Convention on Cyber Security and of Personal Data Protection 2014 Art. 9(1)(b).
101 Ibid.
102 Data Protection Act 2021 (Kenya); Protection of Personal Information Act No. 4 of 2013 (South Africa); Data Protection Act 2012 (Ghana); Data Protection Act 2021 (Zambia); Data Protection and Privacy Act 2021 (Uganda); Nigeria Data Protection Regulations 2019; Data Protection Law Resolution No. 151 of 2020 (Egypt).
103 Daigle B 'Data Protection Laws in Africa: A Pan-African Survey and Noted Trends' at 8.
104 Ibid.
105 Bryant J 'Africa in the Information Age: Challenges, Opportunities, and Strategies for Data Protection and Digital Rights' at 410.
106 Ibid. at 411.
107 Research ICT in Africa: 'AI in Africa: regional data protection and privacy policy' at 4.
108 Norwegian Data Protection Authority Report: 'Artificial intelligence and privacy' at 7.
109 Cate FH et al. 'Expanding the artificial intelligence-data protection debate' at 289–292.
110 CIPIT at 6.
111 Research ICT in Africa: 'AI in Africa: regional data protection and privacy policy' at 3.
112 AI4D Africa: 'Artificial Intelligence Carries a Huge Upside. But Potential Harms Needs to be Managed'.
113 Mabeka at 16.

12.5.4 *Implications on lawyers' duties to their clients*

The ethical implications of the use of AI in legal matters can also be considered considering the legal duties that lawyers owe to their clients.

(a) Competence

Competence requires lawyers to be adequately prepared, have the requisite legal knowledge, skills, and thoroughness.[114] Competence regarding AI involves that lawyers must understand how AI systems work and how it produces results;[115] lawyers must understand the various limitations that AI systems have and how using them can contribute to the improvement of legal services offered to clients;[116] and lawyers have a duty not to automatically accept all AI results as true. AI programs, while technically efficient, are not always perfect and therefore lawyers need to ensure the programs are working properly and review the program's results to provide competent representation.[117] This point is closely related to the duty to supervise, which is also discussed in this chapter.

Generative AI tools can in some instances produce false and erroneous responses that seem very credible. This can occur in instances where the user requests information that is not in the system's training data.[118] Understanding such basic information about AI systems can enable lawyers to review the results of AI systems, provide competent representation for their clients, and avoid misleading their clients or the court with false information that has been generated by AI systems.[119]

One significant issue in the age of AI will be what it means to be competent when AI is well known to have a black box,[120] and when algorithmic decision-making is famously difficult to confidently predict. Should legal ethics expect lawyers to master how AI systems work and how it produces results?[121] Is this even possible? In addition to this, competence surely dictates an understanding of the risks associated with the use of AI.[122] AI systems are not perfect and have certain inherent risks that the lawyer must be aware of. This awareness will enable them to balance the risks and benefits of using AI systems.

In certain jurisdictions, lawyers are required to undergo technical training to use modern technologies such as AI.[123] In such instances, failure to use systems such as

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114 Yamane at 883.
115 American Bar Association Resolutions (ABA Resolutions): Resolution 112 at 5.
116 Ibid.
117 Yamane at 884.
118 Bathaee Y 'The Artificial Intelligence Black Box and The Failure of Intent and Causation' at 10.
119 ChatGPT <https://www.nytimes.com/2023/05/27/nyregion/avianca-airline-lawsuit-chatgpt.html>.
120 An AI black box refers to a situation where the inner workings and decision making of an AI system are not transparent or easily explainable. Therefore, AI systems can sometimes produce results or outputs without clear insight as to how those results were achieved. See also Bathaee.
121 ABA Resolutions: Resolution 112 at 5.
122 Gordon DL and Ambrose RL 'The Ethics of Artificial Intelligence' at 4.
123 Donahue at 5.

electronic discovery could possibly amount to a violation of the duty of competence as it affects the quality and efficiency of the work delivered.[124]

A study done by the *Richmond Journal of Law and Technology* compared the commonly used manual process of review with that of technologically-assisted processes. The result of the study highlighted that technologically-assisted processes substantially exceeded the level of performance of manual review by lawyers.[125] AI tools can synthesise vast amounts of data, identifying relevant topics and summarising trends. In a few years, the use of AI may be an indispensable part of being a lawyer likening it to the use of emails by lawyers.[126]

Although we are yet to come across an instance where the use of AI is considered legal standard for legal services in Africa, we think this could occur soon. Therefore, lawyers in Africa need to reflect carefully on what the duty of competence will require in the age of AI.

Yamane opines that considering the growing popularity of AI systems, refusing to use them might hamper a person's capability to provide competent representation. This is because the more one uses AI the more beneficial the programs become. The refusal to use technology that makes legal work more accurate and efficient may in future be considered failure to provide competent legal representation.[127]

(b) Client confidentiality

Cloud computing is the delivery of computing resources through the internet. Instead of relying on local servers and computers to handle data and process the data, it allows users to access these resources remotely through a network connection.[128] Cloud computing makes it possible for users to access their data and information from a remote location offering increased flexibility.[129]

The cloud-computing presence in Ghana, Nigeria, Kenya and Tunisia is still in its early development stages while it is more prominent in South Africa.[130] Cloud computing in Africa is being used by national and local governments as well as businesses to increase efficiency and save on costs.[131]

AI has been integrated with cloud computing to provide analytic solutions security automation and data-processing applications.[132] The benefits of this are cloud servers have access to large amounts of data which are invaluable to AI systems as where more than one AI is connected, these systems can learn from other AI systems' mistakes. Due to cloud's scalability, AI services provided on the cloud are scalable.[133]

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124 Ibid.

125 Grossman MR and Cormack GV 'Technology-Assisted Review In E-Discovery Can Be More Effective and More Efficient Than Exhaustive Manual Review' at 5.

126 Miller S 'Artificial intelligence and its impact on legal technology: to boldly go where no legal department has gone before'.

127 Yamane at 885.

128 Cassim at 24.

129 Ibid.

130 Research ICT in Africa: 'The cloud over Africa' at 3.

131 Wangui AW and Yusuf M 'Cloud Computing and The Performance of The County Government of Nyandarua, Kenya' at 60

132 Devrukhkar S, Randhe K and Lankennavar SP 'Artificial Intelligence in cloud computing' at 173.

133 Petrović Aand Živković M 'Integration of Artificial Intelligence with Cloud Services' at 381.

Cloud computing has certain characteristics that can raise issues around the duty of confidentiality. Cloud-computing resources and services are often shared among various users and are provided via the internet.[134] It places clients' data under the control of a third-party operator of a cloud service. This risk is heightened for public cloud services which allow users to access the cloud via mainstream web browsers. Public cloud services offer less security than other cloud models as data accessed on the cloud can be the subject of a malicious attack.[135] This inevitably raises privacy and confidentiality concerns.

The duty of client privilege and confidentiality would likewise be implicated by using AI. There are two main aspects of AI that affect client's privacy and the duty of confidentiality, namely the software itself can make decisions. They require huge volumes of quality data to make intelligent decisions.[136] Also, AI systems develop by learning from experience. AI systems obtain experience from the data it is fed with, and this data can be personal data belonging to clients.[137]

Lawyers must safeguard clients' information from unauthorised disclosure.[138] Such a duty can be triggered when a lawyer uses an AI system provided by a third party. As a result, they have to disclose confidential information to these third-party AI systems to which such third parties would otherwise not have access.[139] The privacy concerns are especially common when using public tools such as ChatGPT.[140] Cyber criminals can use ChatGPT and other AI chat bots' conversations to gain access to a person's confidential information leading to the theft of data of commission of fraud. Additionally, if any data is shared on ChatGPT, it can be accessed by authorised users leading to a data leak.[141]

Confidentiality concerns are present even for other AI tools. Generally, AI tools are considered the most effective when they have access to data and this can be an incentive to feed as much relevant client information into the tool to improve the quality of outcomes.[142] In such instances, the client's confidential information becomes a pivotal part of the tool providing value to other clients. This involves disclosing confidential information of a client without their authorisation.[143]

To combat the risks of unauthorised disclosure, the duty would require lawyers to take all reasonable steps to communicate with their clients about the potential privacy risks. Furthermore, lawyers should consult with the AI providers about the information that will be provided to them, how the information will be handled and stored, and the

134 International Telecommunication Union: 'Cloud computing in Africa Situation and perspectives' at 3.
135 Heyink M 'An Introduction to Cloud Computing – Legal Implications for South African Law Firms' at 3.
136 Norwegian Data Protection Authority Report at 7.
137 Ibid.
138 Mayfield A 'Decrypting the Code of Ethics: The Relationship Between an Attorney's Ethical Duties and Network Security s Ethical Duties and Network Security' at 565.
139 Shope ML 'Lawyer and Judicial Competency in the Era of Artificial Intelligence: Ethical Requirements for Documenting Datasets and Machine Learning Models' at 193.
140 Thomson Reuters: ChatGPT and Generative AI within Law Firms at 14.
141 Sebastian G 'Do ChatGPT and Other AI Chatbots Pose a Cybersecurity Risk? An Exploratory Study' at 8.
142 Surden H 'Machine Learning and Law' at 100.
143 Ibid.

safeguards put in place to protect the privacy of their clients.[144] Only after they have received this information and safeguards have been placed to protect privacy should lawyers process to use such AI systems.[145] It is also prudent for lawyers to get their clients written informed consent to enable them to use their data to develop AI systems by means of an engagement letter. Even in cases where lawyers have this engagement letter, they should strive to disclose the minimum amount of information necessary.[146]

When it comes to confidentiality, there are two kinds of states: weaker model states and stronger model states. In weaker model states, lawyers are required to keep client information private but there is no obligation to place measures to protect client confidentiality.[147] On the other hand, stronger model states place a higher burden on lawyers and require more stringent measures to be put in place to protect confidentiality.[148] Irrespective of the kind of model that is used in the various African states, AI will ultimately affect confidentiality and client privilege.

(c) Licence to practise law

Legal ethics rules bar lawyers from practising in countries where they lack jurisdiction.[149] Unauthorised practice of law serves to protect the public from receiving legal advice from persons who are not qualified.[150] The rationale for this is those unlicensed individuals are not bound by ethical rules, rules of confidentiality, and conflict of interest.[151]

Legal technology with ML capabilities makes it easy for various software to provide legal advice and produce documents such as contracts following the completion of questionnaires.[152] AI legal reasoning and advice can be categorised under two main levels. The first level is advanced-assistance automation which enables such tools to conduct activities like case predictions. The second level is semi-autonomous automation which uses ML and deep learning for legal reasoning. Both levels have aspects of legal advice and reasoning and can form an unauthorised practice of law.[153]

Schindler opines that legal-ethics rules should be applied in AI matters for two main reasons: an advocate-client relationship is formed as some AI systems go over and above simply providing legal information and provide clients with legal advice which constitutes a legal service.[154] Consequently, since law-related services are subject to ethical guidelines, AI systems that provide legal services such as legal advice should be subject to legal ethics standards.[155] Should AI systems that provide legal advice be

144 ABA Resolutions: Resolution 112 at 6.
145 Gordon and Ambrose at 6.
146 Model Rules of Professional Conduct 2023 r 1.6(b)(1).
147 Mayfield at 569.
148 Ibid. at 572.
149 Yamane at 887.
150 Moradian J 'New Era of Legal Services: The Elimination of Unauthorized Practice of Law Rules to Accompany the Growth of Legal Software' at 256.
151 Ibid.
152 Elliot L 'Authorized and Unauthorized Practices of Law: The Role of Autonomous Levels of AI Legal Reasoning' at 2.
153 Ibid. at 8.
154 Schindler L 'Skirting the Ethical Line: The Quandary of Online Legal Forms' at 175.
155 Ibid. at 177.

regulated by legal ethics? How can legal ethics regulators in Africa regulate the legal output of AI systems?

(d) Duty to supervise

Lawyers have a duty to supervise any lawyers and non-lawyers who they engage in the provision of legal services.[156] Applying this to AI systems, lawyers have a duty to supervise the AI to ensure that the legal services comply with legal ethics standards.[157] AI systems have limitations in terms of dealing with certain abstractions, conceptualisation, and cognitive tasks that arise as a result of a lawyer's experience and therefore need supervision.[158] Moreover, lawyers must ensure that they take steps to verify the AI's work is complete and correct and that the client's information is not put at risk.[159] Some lawyers currently using generative AI have likened supervising AI to how a senior associate reviews the work of a junior associate. The AI model will be used to create a draft which will then be reviewed.[160]

This brings us to the major question to be answered: Will lawyers have a duty to supervise the AI to ensure that the legal services comply with legal-ethics standards? If the answer to that is yes, what would substantive supervision look like? Is it even possible, given the AI blackbox and expert knowledge required to train algorithms?

Lawyers need to create a balance and avoid underutilising the AI systems which will result in inefficiency and excessive costs for the client. Inversely, they must avoid overutilisation of AI and thereby neglecting their duty to supervise.[161] The challenge for rules of legal ethics will be enormous.

12.6 Conclusion

In the same way that is it transforming numerous other areas of human life, AI is set to transform the practice of law everywhere. This chapter demonstrates the opportunities and challenges that the rules undergirding legal ethics in African countries will have to confront. The promise is significant, but the risks are troubling.

12.7 References

Adams R 'AI in Africa: Key Concerns and Policy Considerations for the Future of the Continent' Africa Policy Research Institute (30 May 2022).

Ade-Ibijiola A and Okwonkwo C 'Artificial intelligence in Africa: Emerging Challenges' in Eke DO, Wakunuma K and Akintoje S (eds) *Responsible AI in Africa: Challenges and Opportunities*.

Africa Law Tech: 'An analysis of virtual courts in Africa' (Power Point Presentation).

Aslan E: 'AI boosts contract analysis' *ABA Law Technology Today* (April 2019).

Bathaee Y 'The Artificial Intelligence Black Box and The Failure of Intent and Causation' *Harvard Journal of Law & Technology* Vol. 31 No. 2 (2018) 898–938.

156 Gordon and Ambrose at 7.
157 ABA Resolutions: Resolution 112 at 6.
158 Surden H 'Artificial Intelligence and Law: An Overview' at 1330.
159 Gordon and Ambrose at 7.
160 Thomson Reuters: ChatGPT and Generative AI within Law Firms at 11.
161 Cerny, Delchin and Nguyen at 6.

Boucher P 'Artificial intelligence: How does it work, why does it matter, and what can we do about it' European Parliamentary Research Service (EPRS) (June 2020).

Bryant J 'Africa in the Information Age: Challenges, Opportunities, and Strategies for Data Protection and Digital Rights' *Stanford Technology Law Review* Vol. 24(2) (28 May 2021) 389–439.

Cassim F 'The use of electronic discovery and cloud-computing technology by lawyers in practice: Lessons from abroad' *Journal for Juridical Science* Vol. 42 No. 1 (2017) <DOI: https://doi.org/10.18820/24150517/JJS42.v1.2>.

Castro D 'The rise of data poverty in America' Centre for Data Innovation (10 September 2014).

Cate FH, Kuner C, Lynskey O, Millard C, Loideain NN and Svantesson DJB 'Expanding the artificialintelligence-data protection debate' https://www.repository.law.indiana.edu/facpub/ 2729.

Cerny J, Delchin S and Nguyen H 'Legal Ethics in the Use of Artificial Intelligence' *Squire Patton Boggs* (January 2019).

CIPIT: 'State of AI in Africa 2023 Report'.

Conrad JG) 'E-Discovery revisited: the need for artificial intelligence beyond information retrieval' *Arteficial Intelligence and Law* Vol. 18(4) (2010) 321–345.

Daigle B 'Data Protection Laws in Africa: A Pan-African Survey and Noted Trends' *Journal of International Commerce and Economics* (February 2021) 1–28.

Davis JP 'Law without mind: AI, Ethics and Jurisprudence' *California Western Law Review* Vol. 55(1) (2018) 165–220.

Dawuni JJ 'The legal profession in Ghana: from indigenization to globalization' *International Journal of the Legal Profession* Vol. 29(1) (2022) 75–101.

Deloitte: 'Artificial intelligence and machine learning in e-discovery and beyond: Driving efficiencies in e-discovery using AI'.

Deloitte: 'The future of eDiscovery: The vital role of EDRM'.

Devrukhkar S, Randhe K and Lankennavar SP 'Artificial Intelligence in cloud computing' *International Research Journal of Modernization in Engineering Technology and Science* Vol. 4(12) (December 2022) 173–176.

Donahue L 'Primer on Using Artificial Intelligence in the Legal Profession' *Jolt Digest* (3 January 2018).

Eke DO, Wakunuma K and Akintoje S (eds) *Responsible AI in Africa: Challenges and Opportunities* (Switzerland: palgravemillan, 2023).

Elliot L 'Authorized and Unauthorized Practices of Law: The Role of Autonomous Levels of AI Legal Reasoning' *arXiv* (2008) 2.

Goodman CC 'AI/ESQ: Impacts of Artificial Intelligence in Lawyer-Client Relationships' *Oklahoma Law Review* Vol. 72:149 (2019) 149–184.

Gordon DL and Ambrose RL 'The Ethics of Artificial Intelligence' Jackson Lewis PC (2017) 1–7.

Grossman MR and Cormack GV 'Technology-Assisted Review In E-Discovery Can Be More Effective and More Efficient Than Exhaustive Manual Review' *Richmond Journal of Law and Technology* Vol. 17(3) (2011) 1–48.

GSMA: 'State of Mobile Internet Connectivity 2021 Report'.

Gwagwa A, Kachidza P, Siminyu K and Smith M 'Responsible Artificial Intelligence in Sub-Saharan Africa: Landscape and general state of play' International Development Research Centre (IDRC) 16.

Heyink M 'An Introduction to Cloud Computing – Legal Implications for South African Law Firms' (LSSA Guidelines, 2012).

International Telecommunication Union: 'Cloud computing in Africa Situation and perspectives' (April 2012).

International Trademark Association Committee Report: 'The Use of Artificial Intelligence in Trademark Proceedings' (21 April 2021).

Iskander MM 'Egypt: Pioneers In Integrating Artificial Intelligence To Enhance The Efficiency Of Lawyers And Tax Professionals' Mondaq (27 March 2023) <https://www.mondaq.com/new-technology/1297704/pioneers-in-integrating-artificial-intelligence-to-enhance-the-efficiency-of-lawyers-and-tax-professionals> (accessed 3 July 2023).

Jahankhani H, Akhgar B, Cochrane P & Dastbaz M (eds) *Policing in the Era of AI and Smart Societies* (199–215) (Springer Nature Switzerland: Advanced Sciences and Technologies for Security Applications) AG Advance online publication <https://doi.org/10.1007/978-3-030-50613-1_9201>.

Javadi SA, Norval C, Cloete R and Singh J 'Monitoring AI Services for Misuse' (New York: Association for Computing Machinery, 2021) 597–607.

Karnavas MG *Lawyer's Ethics* (OSCE Mission to Skopje, 2016).

Kira Systems: 'How Law Firms Leverage Kira's AI to Cut Contract Review Time by Up to 60%' 2019 Edition 3.

Kufakwababa CZ 'Artificial intelligence tools in legal work automation: The use and perception of tools for document discovery and privilege classification processes in Southern African legal firms' (Stellenbosch University: Thesis (MA), 2021).

Lat D 'The Ethical Implications of Artificial Intelligence' (Thomson Reuters: Above the Law, 2020) <https://abovethelaw.com/law2020/the-ethical-implications-of-artificial-intelligence/>.

Legg M and Bell F 'Artificial Intelligence and the Legal Profession' *University of Tasmania Law Review* Vol. 38(2) (2019) 34–59.

Lim D 'Predictive Analytics' *Loyola University Chicago Law Journal* Forthcoming (9 April 2019) <https://ssrn.com/abstract=3369212 161>.

Mabeka NQ 'An Analysis of the Implementation of the CaseLines System in South African Courts in the Light of the Provisions of Section 27 of the Electronic Communications and Transactions Act 25 of 2002: A Beautiful Dream to Come True in Civil Procedure' *PER/PELJ* 2021 (24) <DOI http://dx.doi.org/10.17159/1727-3781/2021/v24i0a8707> 15.

Macnish K, Wright D and Jiya T 'Predictive Policing in 2025: A Scenario' in Jahankhani H, Akhgar B, Cochrane P & Dastbaz M (eds) *Policing in the Era of AI and Smart Societies* 199–215.

Mayfield A 'Decrypting the Code of Ethics: The Relationship Between an Attorney's Ethical Duties and Network Security s Ethical Duties and Network Security' Oklahoma Law Review Vol. 60(3) (2007) 547–603.

Miller S 'Artificial intelligence and its impact on legal technology: to boldly go where no legal department has gone before' *Thomson Reuters* <https://legal.thomsonreuters.com/en/insights/articles/ai-and-its-impact-on-legal-technology>.

Mnyongani F 'Whose morality? Towards a legal profession with an ethical content that is African' *SA Public Law* Vol. 24 No. 1 (January 2009) 121–134.

Moradian J 'New Era of Legal Services: The Elimination of Unauthorized Practice of Law Rules to Accompany the Growth of Legal Software' *William & Mary Business Law Review* Vol. 12(1) (2020–2021) 256 <https://scholarship.law.wm.edu/wmblr/vol12/iss1/7>.

Nicolson D 'Making lawyers moral? Ethical codes and moral character' *Legal Studies* Vol. 25(4) (November 2005) 601–626 <DOI:10.1111/j.1748-121X.2005.tb00686.x>.

Nigerian Communication Commission: 'Ethical and Societal Impact of Artificial Intelligence'.

Norwegian Data Protection Authority Report: 'Artificial intelligence and privacy' (January 2018).

Open Data Barometer: 'Sub-Saharan Africa Regional Snapshot' <https://opendatabarometer.org/ 4thedition/regional-snapshot/sub-saharan-africa/>.

Petrović A and Živković M 'Integration of Artificial Intelligence with Cloud Services' *Research Gate* (2019) 381–387.

Research ICT in Africa: 'AI in Africa: regional data protection and privacy policy' (December 2019) <https://researchictafrica.net/wp/wp-content/uploads/2020/11/RANITP2019-3-DataProtection.pdf>.

Research ICT in Africa: 'The cloud over Africa' <https://www.researchictafrica.net/publicati ons/Evidence_for_ICT_Policy_Action/Policy_Paper_20_The_cloud_over_Africa.pdf>.

Rigano C 'Using Artificial Intelligence to Address Criminal Justice Needs' *National Institute of Justice Journal* Issue No. 280 (January 2019) 1–10.

Robertson M and Kruuse H 'Legal ethics education in South Africa: possibilities challenges and opportunities' *South African Journal on Human Rights* Vol. 32(2) (2016) 344–374.

Rutenberg I, Gwagwa A and Omino M 'Use and Impact of Artificial Intelligence on Climate Change Adaptation in Africa' *African Handbook of Climate Change Adaptation* (2020) 1107–1126.

Schindler L 'Skirting the Ethical Line: The Quandary of Online Legal Forms' *Chapman Law Review* Vol. 16(1) (2012) 164–186.

Sebastian G 'Do ChatGPT and Other AI Chatbots Pose a Cybersecurity Risk? An Exploratory Study' *International Journal of Security and Privacy in Pervasive Computing (IJSPPC)* Vol. 15(1) (2023) 1–11.

Shope ML 'Lawyer and Judicial Competency in the Era of Artificial Intelligence: Ethical Requirements for Documenting Datasets and Machine Learning Models' *The Georgetown Journal of Legal Ethics* Vol. 34(1) (2021) 193.

Stanford University: 'Artificial Intelligence Index Report 2023' 20–30.

Stier S 'Legal Ethics: The Integrity Thesis' *Ohio State Law Journal* Vol. 52 No. 2 (1991) 551–609.

Surden H 'Artificial Intelligence and Law: An Overview' *Georgia State University Law Review* Vol. 34(4) (2019) 1305–1377.

Surden H 'Machine Learning and Law' *Washington Law Review* Vol. 89(87) (2014) 87–115.

Thomson Reuters: CaseLines: An introduction to the Evidence Sharing Platform <https://tbla.ca/ wp-content/uploads/2021/10/2021-TBLA-Civil-CaseLines-from-Invite-to-Presentation-handout.pdf>.

Thomson Reuters: ChatGPT and Generative AI within Law Firms (2023) 1–17.

UN Economic Commission for Africa: 'The Africa Data Revolution Report 2018: The Status and Emerging Impact of Open Data in Africa (2019) <https://repository.uneca.org/han dle/10855/43341>.

Unitedlex: AI-Driven Commercial Contract Review <https://unitedlex.com/insights/ai-driven-commercial-contract-review/> .

Van Zyl CH IV and Visser J-M 'Legal Ethics, Rules of Conduct and the Moral Compass – Considerations from a Law Student's Perspective' *PER/PELJ* Vol. 19 (2016) 1–18 <https://doi.org/10 .17159/1727-3781/2016,v19i0a795>.

Wangui AW and Yusuf M 'Cloud Computing and The Performance of The County Government of Nyandarua, Kenya' *Social Sciences & Humanities Open* 3 (2022) 57–68.

World Bank Group: *Digital Africa: Technological Transformation for Jobs* 1.

Yamane N 'Artificial Intelligence in the Legal Field and the Indispensable Human Element Legal Ethics Demands' *The Georgetown Journal of Legal Ethics* Vol. 33 (2020) 877–890.

Yeboah K 'Artificial Intelligence in Sub-Saharan Africa: Ensuring Inclusivity' *Paradigm Initiative* 1–17.

Chapter 13

Artificial intelligence in the African energy and mining sectors: Legal and regulatory review

13.1 Introduction

In accordance with global trends, African extractive industries are also increasingly embracing digital or technological transformation and automation – the so-called Fourth Industrial Revolution (4IR).[1] Digitalisation refers to the application of information and communication technologies (ICT) across economic sectors.[2] It constitutes a range of digital technologies such as artificial intelligence (AI), which is the focus of this chapter.

From, on the one hand, meeting the demands of the energy transition, promoting cost reduction and increased efficiencies for corporations to be equipped better to withstand future economic shocks such as those brought about by the Covid-19 pandemic, to improving safety, on the other hand, AI is seeing the most uptake in the energy, large-scale mining, and oil and gas industries, as is discussed below. The World Economic Forum (WEF) projects that by 2025, AI will be applied in virtually all work processes along the entire mining value chain.[3] Also, according to a report by PricewaterhouseCoopers (PwC), AI is set to add $15.7 trillion to the global GDP, with $6.6 trillion expected to emanate from increased productivity, whereas $9.1 trillion would be from consumption.[4]

Central to understanding AI is the notion that with the right data, machines or computer systems become more 'intelligent' and think like human beings, since they utilise the data to learn and adapt. These computer systems are enabled to possess cognitive abilities that are ordinarily associated with human beings such as possessing sensory and learning capabilities, reasoning and problem-solving as well as decision-making abilities, with little to no human interference.[5] This conception of AI implies that, by its inherent nature, it could replace human labour, hence the global discourses around the effects that AI will have on employment. As a result, part 13.2.2 below analyses the future prospects of AI and its resultant effects on labour, within the African context. AI often manifests itself in sophisticated and technologically-advanced machines such as drones, robots, autonomous vehicles and 'smart' cars etc.[6]

1 AU Press Release: 'African Digital Transformation Strategy and African Union Communication and Advocacy Strategy among major AU initiatives in final declaration of STCCICT3'.
2 IEA: 'Digitalization and Energy' at 22.
3 WEF: White Paper: 'Digital Transformation Initiative: Mining and Metals Industry' at 10.
4 Verweij G and Rao A 'Sizing the prize: what's the real value of AI for your business and how can you capitalise?' at 32.
5 Zhang L et al. *Artificial Intelligence in Construction Engineering and Management* at v (Preface).
6 Ibid. at 4.

Like other products or services, AI is subject to laws and regulations relating to, among others, data safety and privacy, intellectual property (IP) rights, protection against cyber security, liability for possible harm caused by these systems, risk allocation, insurance, among other aspects of social wellbeing. AI is broad in application, as there are multiple use cases for these technologies, some of which are highlighted under part 13.2.1 below.[7] Countries across the world, including within the African continent, are increasing efforts to strengthen their regulation of AI, as these technologies gradually become ubiquitous across industries such as in the energy and large-scale mining sectors.[8]

It is against this contextual background that this chapter embarks on a review of the legal and regulatory framework of regulating AI in the African energy and large-scale mining industries, with the objective of identifying existing gaps in regulation, thereby making the case for improved and robust frameworks to address the different aspects of AI such as data protection and security, labour concerns, among others. The framework with respect to artisanal and small-scale mining (ASM) is also addressed, albeit to a lesser extent as opposed to large-scale mining, owing to the nature of the sector, as it comprises informal and often unregulated mining operations that do not necessarily employ sophisticated technologies such as AI.[9]

The chapter commences with an overview of the current landscape in terms of the use cases for AI, that is to say the main applications and future prospects of AI in the energy and mining sectors across Africa. This overview positions these sectors, relative to the global landscape, to show the prevalence of AI technologies. It incorporates specific practical examples of mining and energy companies that are utilising AI technologies in their operations. A discussion of the prospects of AI for these industries as well as the concomitant effects on labour, particularly considering the focus on local content aspects in policies across Africa, follows.

Further, the chapter proceeds to the crux of the discussion, which is to review the legal and regulatory framework for AI in the African energy and mining sectors. The objective of this chapter is to identify policy gaps, which makes the case for improved and more robust regulatory frameworks to regulate AI in the African energy and mining sectors. It uses South Africa as a case study example, a country that is regarded as among the most digitalised across the African continent and that is progressively accelerating the use of AI across its domestic industries. Lastly, the legal and regulatory review further presents policy options and recommendations for governments to develop appropriate legal and policy frameworks to regulate properly AI in the African energy and mining sectors, including a discussion of the extent to which the regulation of AI across the European Union (EU) is relevant for the African continent to address the existing policy gaps.

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7 Ibid. at 12.

8 Erdélyi OJ and Goldsmith J 'Regulating Artificial Intelligence: Proposal for a Global Solution' at 1.

9 Nalule VR *Mining and the Law in Africa: Exploring the social and environmental impacts* at 22.

13.2 Applications and future prospects of artificial intelligence in the African energy and large-scale mining sectors

Despite comprising distinct economic sectors, the energy and mining sectors are intrinsically intertwined – the symbiotic relationship between them is manifested through their interdependentness. Today, energy constitutes the most significant expenses for the mining sector – between 15 % and 40 % of the total operating costs – therefore the availability and cost of energy is key to the continuity of mining operations.[10] Mining operations often require substantial energy sources, as mining companies today are increasingly integrating renewable energy into their operations to ensure the sector remains resilient.

Although the energy and large-scale mining sectors have been early adopters of automation and digital technologies dating back to the 1960s, the pace of adoption is accelerating today. This acceleration can be attributed mainly to advances in computing power and capabilities, as well as the falling costs of these technologies over the past decade.[11] Technologies such as AI, machine learning, robotics, among others, are transforming the extractives industry landscape around the world.[12] AI, taking centre stage in the present 4IR era, is especially receiving the most uptake in the aforementioned sectors.

Also, the Covid-19 pandemic experienced globally from the beginning of 2020, accelerated the progress towards digitalisation across industries. With respect to the energy sector in particular, the 4IR is anticipated to play a crucial role in the transition to low-carbon economies,[13] a global imperative in tackling the adverse effects of climate change.[14] Similar sentiments have been expressed regarding the mining sector, as companies continue to embrace these new technologies in their operations, mainly to increase productivity and efficiency, to enhance health and safety in their operations, and for multiple other reasons, some of which are canvassed in the following section.

13.2.1 *Use cases for artificial intelligence in the energy and large-scale mining sectors in Africa*

The mining sector directly affects several other economic sectors, as it provides the requisite raw materials, including for the energy sector. Coal, for instance, which countries such as South Africa heavily rely on for its electricity supply, as well as the platinum group metals (PGMs) that have a variety of uses in the global energy sector, among other natural resources, are derived from mining operations. With respect to both large-scale and small-scale mining, they are increasingly utilising AI in innovative ways to optimise processes, enhance decision-making, derive value from data, improve safety, among a myriad of other benefits, as is discussed below This discussion addresses several specific applications of AI technologies, including various practical

10 Mining Weekly: 'Weighing up renewable energy'.
11 IEA: 'Digitalization and Energy' at 22.
12 Wisskirchen et al. 'Artificial Intelligence and Robotics and Their Impact on the Workplace' at 9.
13 Tahini AAI 'From 4IR to hydrogen: How technology can accelerate the move toward low-carbon economies'.
14 UNFCCC: 'Paris Agreement'.

examples of energy and mining companies that are presently utilising these technologies across Africa.

(a) Key applications of artificial intelligence in the energy sector across Africa

Energy is used in everyday life for electricity generation, to power industries, for domestic uses such as heating and cooking, among multiple other uses.[15] A fundamental use case for AI in the energy sector is to optimise the functionality of power grids,[16] considering the potential increases in the production of energy from decentralised renewable sources. This optimisation makes the grids more efficient, reliable, and sustainable. AI technology has been incorporated to perform different types of tasks, such as controlling, forecasting, and facilitating efficient operations.

Power grid operators turn to AI to collect data, which in turn requires constant monitoring, analysis and interpretation.[17] These processes not only ensure that electricity supply meets demand, but also facilitate the smooth management of the intermittent supply of energy from renewable, nuclear and fossil fuel sources.[18] For example, PowerGen Renewable Energy,[19] a Kenyan renewable energy company that builds and manages energy infrastructure including microgrids, uses AI to optimise the operation of the microgrids, thus improving the reliability and efficiency of electricity supply, particularly in the remote areas of the country and across the continent.[20] Also in South Africa, the Council for Scientific and Industrial Research (CSIR) utilises AI-based solar and wind forecasting tools to enhance the stability of the grid and to minimise the effects of intermittent renewable energy supply.

Amid the continued adoption of electric vehicles (EVs) and distributed energy resources such as solar, wind and battery power becoming more widespread and adding more load to the grid, they tend to cause disruption and grid-reliability challenges.[21] Therefore, AI becomes the most efficient technology to mitigate these effects, by better managing data to streamline processes, thus building the resilience of the grid.[22] Also, AI algorithms assist in forecasting renewable energy generation from various sources, for example, by resorting to analytics to scan the vast quantities of data collected, thereby proactively managing the grid.[23] For example, ABB, a global leader in electrification and automation that operates across several African countries such as South Africa, Angola, Tanzania, Uganda, Zambia, Nigeria, Cameroon, among others, adopt AI technologies to predict unexpected peaks in power consumption, thereby optimally managing the grid.[24]

15 Nalule V and Acheampong T 'Energy Transition Indicators in African Countries: Managing the Possible Decline of Fossil Fuels and Tackling Energy Access Challenges' at 2.
16 WEF: 'Why artificial intelligence is key to renewable energy grid resilience'.
17 Ibid.
18 Marot A et al. 'Towards an AI Assistant for Power Grid Operators' at 81–82.
19 PowerGen Renewable Energy.
20 Ibid.
21 Leel H and Clark A 'Charging the Future: Challenges and Opportunities for Electric Vehicle Adoption'.
22 Newman N 'AI: the energy industry's untapped resource'.
23 Ibid.
24 ABB: 'ABB uses AI to revolutionize energy management'.

Additionally, wind-farm operators require to collect real-time weather conditions and wind speed, the actual output of the turbines and the amount generated to the grid, thus leveraging AI for this purpose.[25] An example is EDP Renewables, a global renewable energy company, which presently employs AI technologies to optimise wind-farm operations.[26] These technologies analyse data relating to wind patterns, performance of the wind turbines, and energy demand, to maximise wind-energy generation and grid integration.[27] Further, AI-enabled smart meters and smart grid technologies are already being used, both in households and by businesses, to reduce energy consumption and enhance overall energy management by adjusting energy usage accordingly.[28] For example, Rensource Energy, a Nigerian renewable-energy company, resorts to AI algorithms to optimise energy usage in commercial buildings, thereby resulting in significant cost savings.[29] With the continued development of AI in the future, there will inevitably be more innovative applications in terms of optimising the functionality of power grids.

Another key-use case of AI in the energy sector is in providing energy access and rural electrification, especially in developing countries facing energy security challenges.[30] More than half of the population of Africa lacks access to clean and reliable energy, hence the need to accelerate the provision thereof. The case for clean energy in Africa has never been more compelling than it is today, as a result of multiple factors such as increased demand caused by increasing population growth, urbanisation, industrialisation and trade, and the international obligations to tackle the adverse effects of climate change. AI is presently being used to streamline the planning and deployment of off-grid renewable-energy systems in rural areas,[31] thereby assisting governments, independent power producers (IPPs) and other stakeholders in the energy sector to provide access to clean and reliable energy in these areas and to improve the quality of life of communities. For instance, the Kenyan clean-energy company, Powerhive, adopts AI algorithms to identify potential customers and predict energy demand in rural communities,[32] thus alleviating energy poverty by expanding access to clean energy.

The above comprises a few key examples to depict some of the major use cases of AI in the African energy sector. These technologies are helping to make the energy sector more efficient and secure, across the African continent, therefore more energy companies will seek to adopt modern technologies in their operations across the continent.

(b) Key applications of artificial intelligence in the large-scale mining sector across Africa

To begin with, there is always uncertainty that a mining venture will be successful and that deposits of natural resources will be discovered in a particular venture. Therefore

25 See Newman.
26 EDP Renewables: 'What we do: Wind energy'.
27 Ibid.
28 Miteva S 'The Future of Innovative Smart Grid Technologies'.
29 Rensource Energy: 'Rensource Energy Announces 1.4 MW of New Projects for 2023'.
30 IRENA: 'Off-grid renewable energy solutions to expand electricity access: An opportunity not to be missed' at 17.
31 Ibid.
32 Powerhive: 'About'.

accuracy and efficiency determine productivity and return on investment in this capital-intensive sector. As mining companies move into harsher environments and other hard-to-reach areas, any errors in location, resource distribution and weather prediction, could pose severe implications. AI is applicable in these circumstances, as it assists in ensuring predictability and accuracy, through analysing maps of an area and conducting geological surveys, thereby providing accurate information and assisting in identifying new and potentially valuable areas to mine or drill.[33] For example, the De Beers Group in Botswana, Namibia and South Africa currently employs AI algorithms and blockchain technologies to enhance accuracy and predictability in its diamond exploration and resource modelling activities.[34]

Secondly, AI technologies are crucial to improving efficiency and safety during mining operations. Anglo American, which is regarded as the largest mining company in South Africa and the second largest platinum producer in the world, possesses approximately 1000 real-time smart-sensor machine-vision systems that utilise state-of-the-art deep neural networks, which go beyond the conventional machine-vision systems that the company used previously, to improve efficiency and safety in its mining operations.[35] Deep-neural networks are a form of AI that recognise patterns and make complex decisions based on large amounts of data, using predictive analytics to anticipate potential equipment failures thereby allowing for proactive maintenance to mitigate against interruptions to operations, detect defects in ores, and monitor the safety of mine workers.[36] Not only has the use of deep-neural networks and advanced machine-vision systems assisted Anglo American Platinum to improve its operational efficiency and enhance the productivity of its workers, but these systems have also helped to reduce costs and improve the quality of products. Another South African mining company that adopts AI safety-monitoring systems to prevent accidents and ensure the safety of mine workers, as well as for processing gold, is Sibanye-Stillwater.[37] The advantages of deep-neural networks and advanced machine-vision systems make AI technologies attractive to mining companies.

Additionally, autonomous mining equipment also ensure increased safety in mines, by, for example, predicting and avoiding accidents before they occur, monitoring for tremors or landslides and temperature variations underground etc.[38] With greater precision, autonomous self-driving vehicles for instance are already increasing the efficiency and effectiveness of operations. Mining companies such as Rio Tinto, an Anglo-Australian multinational company and one of the world's largest metals and mining companies, have already realised performance gains through adopting AI and other technologies for their operations, particularly in terms of mobility.[39] It has, since 2018, used autonomous vehicles, trains and haul trucks that run without human intervention and, therefore, are handy in dangerous terrains and harsh weather conditions.[40] Within the African continent, Rio Tinto's mining operations in South Africa have

33 Schmelzer R 'AI Helping Extract Value In The Mining Industry'.
34 De Beers Group: 'De Beers Group introduces world's first blockchain-backed diamond source platform at scale'.
35 AngloAmerican: 'FutureSmart Mining'.
36 Fu Y and Aldrich C 'Deep Learning in Mining and Mineral Processing Operations: A Review'.
37 Mining Weekly: 'Sibanye-Stillwater appoints DataProphet to implement an AI powered plant optimisation system'.
38 See Schmelzer.
39 Rio Tinto 'Smart Mining'.
40 Ibid.

in recent years implemented autonomous haulage systems that utilise AI and advanced sensors to transport ore and reduce the reliance on human-operated vehicles.[41] According to the company, these trucks are safer and approximately 15% cheaper to operate than those driven by human beings.[42] The trucks are also much more efficient, as they can operate constantly, without the need for shift changes and breaks, and can also navigate narrow underground tunnels, as opposed to mine workers. Autonomous vehicles also complement the clean energy transition by reducing drastically the fuel consumption by conventional trucks in processes such as loading, hauling, crushing, and drilling.

Although foreign AI technologies continue to dominate in the region as multinational companies increasingly expand their operations across the African continent, multiple innovative African energy and mining companies are also making strides in terms of adopting AI for the efficient extraction of resources, that is to say 'smart' mining.[43] A large proportion of these companies constitute start-ups, which are relatively popular in countries such as South Africa, Kenya and Nigeria.[44] The majority of AI usage on the continent is by privately-owned small, medium and micro enterprises (SMMEs). This statistic shows that AI is not only used by large corporations, thereby enabling smaller businesses to play an active role in the AI ecosystem on the continent. However, these companies require further investments in AI technologies to upscale their operations and be in a position to compete with larger multinational companies. Although some receive funding from venture capital and private equity firms from across the world, the majority of them lack access to these resources to enable them to participate fully in the AI ecosystem.

Furthermore, the Syama gold mine in Mali is regarded as the world's first fully automated mine.[45] At this underground mine, Resolute Mining (that is to say Africa-focused Australian mining company) has been utilising automated vehicles and drilling equipment to extract gold deposits, quantified at 300,000 ounces a year.[46] According to the company's leadership team, the application of these AI-enabled technologies has resulted in mining processes becoming more efficient and less costly, thus contributing to increased productivity.[47] With effective digitisation, challenges relating to information management in the mining sector are also easily addressed.[48] The promotion of good governance principles, namely the rule of law, transparency and accountability, is significantly assisted by authentic and available records.[49]

In addition to the above, AI technologies are also seeing continued application in the ASM sector, although to a relatively limited extent compared to large-scale mining. One of the main areas of application is to ensure transparency in the mineral supply chain.

41 Ibid.

42 Walker J 'AI in Mining – Mineral Exploration, Autonomous Drills, and More'.

43 Effoduh JO '7 Ways that African States are Legitimizing Artificial Intelligence'.

44 Ibid.

45 Cuffari B 'Syama: The First Fully Automated Mine'; Signé L' Digitalizing Africa's mines'.

46 See Cuffari.

47 Ibid.

48 Atif I, Cawood FT and Mahboob MA ,The role of digital technologies that could be applied for prescreening in the mining industry during the COVID-19 pandemic' at 663–674. See also Golosinki TS 'Use of the Internet and Information Technology in Mining'.

49 Mosweu O and Rakemane D 'The role of records management in ensuring good governance in Africa' at 103–123.

These technologies can be used to track the origin of minerals, monitor their extraction and processing, and ensure compliance with environmental standards. Delve, a global platform operating across Africa, is currently exploring the use of AI to improve data collection and analysis in the ASM sector on the continent.[50] Through using AI, it aims to create awareness of the socioeconomic and environmental aspects of the sector, support policymaking and facilitate informed decision-making in ASM operations.[51]

Similarly, Minexx, a digital platform for mineral traceability and trading, which operates across Rwanda, Ghana, the Democratic Republic of the Congo (DRC), Burkina Faso and Nigeria, adopts AI technologies to provide access to information and to enhance transparency in the mineral supply chains.[52] With the advent of these technologies, the traceability of mineral purchases, especially those conducted online, has already been improved,[53] thus mitigating crimes such as smuggling and mineral-induced conflicts within mine communities. This function constitutes another use case for AI in the ASM sector, thereby providing ASM miners with access to market information, including real-time pricing, demand trends, and other market opportunities.

Lastly, as is the case with large-scale mining above, AI technologies could also be utilised in the ASM sector to ensure safety and minimise health hazards in mining operations. Algorithms can be utilised to detect or predict potential risks to miners such as exposure to toxic substances, accidents and other hazards, or geological risks.

The discussion above constitutes some of the significant ways in which AI is used to enhance operational efficiency and productivity, improve the safety of mining operations, optimise resource utilisation, and ensure sustainable mining practices in both large-scale and ASM operations. Prior to addressing the existing legal and regulatory frameworks on the continent that regulate the different use cases of AI in both the energy and mining sectors, it is imperative to analyse the future prospects of AI in these sectors, coupled with its concomitant effects on labour.

13.2.2 *Future prospects of artificial intelligence in the energy and mining sectors in Africa, and its resultant effects on labour*

With the continued adoption of AI in industries such as energy and large-scale mining, these technologies will define the future of energy and mining, both globally and specifically within the African continent. According to Sanchez and Hartlieb,[54] several technological trends will shape the mining industry in the future. The most fundamental trend is the continued digital transformation in the industry, whereby there will be increased uptake and incorporation of automation, including the use of AI, across countries.[55] Other important trends will include electromobility, invisible zero-waste mining, and continuous mining.[56] These trends are projected to build a more sustainable and efficient sector, and enhance safety in operations.

50 Delve: 'State of the Artisanal and Small-Scale Mining Sector' at 24.
51 Ibid.
52 Minexx: 'Connecting Miners to the World'.
53 Global RC 'Blockchain for traceability in minerals and metals supply chains: Opportunities and challenges' at 1–21.
54 Sanchez F and Hartlieb P 'Innovation in the Mining Industry: Technological Trends and a Case Study of the Challenges of Disruptive Innovation' at 1398.
55 Ibid.
56 Ibid.

Considering the projections indicating that the future of the energy and mining sectors will be more digital, there are mounting concerns that the adoption of AI and other novel technologies will disrupt labour markets drastically, leading to job losses and that certain occupations will be rendered obsolete. This situation is likely to occur since the technologies shift energy and mining from people-oriented operations to process-oriented ones. Scholars such as Paredes and Fleming-Munoz argue that by replacing often repetitive and hazardous tasks with autonomous machinery, as explained above, the need for human labour in such operations will be reduced.[57] On the other hand, other scholars have alleged that by virtue of replacing these tasks with AI technologies, overall productivity will be increased, since AI will not only enable workers to focus on more creative and strategic work, it would also likely include extended usage of technologies such as robots and autonomous vehicles, which have been proven to result in higher productivity for operators.

Despite these assertions that AI will replace certain energy and mining jobs, it will also create new opportunities across these sectors, as long as the respective workers possess the requisite skills to use the technologies effectively. AI technologies will still require some human intervention that would require mining companies to employ more data analysts, engineers and other IT professionals to support and manage these technologies. Therefore, not only will AI incentivise mining companies to provide training opportunities for their workforce to upskill and reskill, but it will also create opportunities that require skills in the implementation and maintenance of AI technologies, data analysis, AI system monitoring, and AI-based decision-making. The demand for skilled workers in occupations such as environmental monitoring, sustainability management, and safety oversight, is also projected to increase. AI technologies will also come in handy in providing training and knowledge transfer to ASM miners, especially relating to sustainable mining practices, health and safety aspects, and environmental management as AI-based educational tools and digital platforms can facilitate remote learning and training.[58]

The overall effect of AI on labour will depend on a number of factors, including the speed at which these technologies are adopted by countries, and the availability of education and training opportunities for workers, among other factors. With the continuing prevalence of AI technologies in the African energy and mining sectors, questions regarding the continent's preparedness for the technological revolution persist. On one hand, there is a great deal of confidence regarding the role that AI could play towards its growth and development, supported by appropriate legal and regulatory frameworks, whereas on the other hand, concerns, particularly among civil society and academia, about the effects of these technologies on labour markets, persist.

One of the main challenges facing the African continent and a major factor explaining why the uptake of AI on the continent has been slow as compared to other regions such as the EU and China, largely relates to existing gaps in the legal frameworks on AI. These gaps are canvassed extensively in part 13.4 of the chapter below. The following section turns to address how these technologies are regulated, both from a continent-wide lens, and domestically, using South Africa as a case-study example.

57 Paredes D and Fleming-Munoz D 'Automation and robotics in mining: Jobs, income and inequality implications' at 191.
58 Stanford University 'AI Tools in Teaching and Learning'.

13.3 Legal and regulatory framework for artificial intelligence in the African energy and mining sectors

On a continental level, the general approach in terms of regulating AI technologies has hitherto been for countries to adopt national AI strategies, plans and other policies to equip themselves for the 4IR. According to The State of AI in Africa Report of 2023,[59] countries such as Mauritius, Egypt, Zambia, Tunisia, and Botswana, have created National AI Programs, while others such as South Africa, Nigeria, Ghana, and Kenya have approved data privacy legislation that may be used to govern AI technology. The report goes on to assert that all these policy frameworks are still in their infancy, thus leaving the deployment of AI on the continent largely unregulated.[60] Mauritius was the first to adopt an AI strategy in 2018,[61] and Kenya went further to establish an AI and blockchain taskforce also in 2018, which comprises representatives from local research institutions, technology companies, and businesses, who were tasked with developing a roadmap for how the country could take advantage of the proliferation of these technologies.[62] These comprise some of the ways in which African countries are already legitimising AI and integrating it into their jurisdictions. These measures are expected to culminate in the eventual enactment of legally-binding and enforceable legislation and policies to regulate AI across the continent.

Despite the existing frameworks in place, this chapter makes the case for improved and more robust regulation of AI, to address the regulatory gaps discussed below under part 13.4. As of 2021, only 28 of the 55 AU member states possessed comprehensive data protection and privacy legislation.[63] Apart from the benefits outlined in the previous section, there are multiple other noteworthy benefits of AI-enabled technologies across different spheres. Some of these include assisting in improving government revenue collection and curbing corruption by enhancing transparency and accountability mechanisms, helping authorities to respond to crimes and terrorist attacks through surveillance systems, drones assisting in delivering much-needed and life-saving medical supplies etc.[64] Coupled with these benefits of AI, there are concomitant vulnerabilities and implications.

The AU previously obligated member states to establish a working group to mitigate these challenges and prepare for the future of AI.[65] However, little progress has been made in this regard, despite the AU itself, also in 2019, forming an AI Working Group to foster a common African stance on adopting AI and tackling common challenges.[66]

In addition to the above, the African Commission on Human and Peoples' Rights (ACHPR) has pronounced on issues relating to AI. The ACHPR published a Resolution in

59 Strathmore University CIPIT Report: 'The State of AI in Africa Report 2023' at 6.
60 Ibid.
61 Kiemde SMA and Kora AD 'Towards an ethics of AI in africa: rule of education' at 36.
62 Ibid.
63 Onuoha R 'Africa – AI in Africa: Regional Data Protection and Privacy Policy Harmonisation' at 60.
64 GAO Report: 'Artificial Intelligence: An Accountability Framework for Federal Agencies and Other Entities' at 27.
65 AU Press Release: 'African Digital Transformation Strategy'.
66 Candelon F, El Bedraoui H and Maher H 'Developing an Artificial Intelligence for Africa strategy'.

2021, calling for comprehensive studies on AI, robotics and emerging technologies.[67] This Resolution implies that there is increasing awareness that there is a need to understand the legal, ethical, safety and security opportunities and challenges that would be brought about by the adoption of AI, robotics, and other emerging technologies, across industries in Africa. Thus, both the African DTS and the ACHPR's Resolution offer opportunities for policymakers across the continent to consider the influence of AI on the continent and to institute appropriate and robust policy and legal frameworks to seize the opportunities and address the challenges brought by AI across Africa.

With the on-going developments of technologies that require little to no direct human stewardship or control, there are substantial legal and ethical implications involved. These implications are not limited to the energy and large-scale mining sectors, as they relate to the use of AI across industries. They require on-going, flexible and informed responses from policymakers, as was acknowledged by the AU in its African DTS explained above.[68] As aforementioned, these implications relate among others to liability for possible harm caused by AI systems, risk allocation, safety, insurance, and privacy — including the perceived pervasive surveillance and influence on peoples' behaviour, IP rights and cyber security risks, which tend to increase when corporations digitalise. It is therefore imperative that African regulators are equipped and prepared to tackle the challenges associated with the mainstreaming of AI in society. Consequently, South Africa, in collaboration with the Smart Africa Alliance, is presently working on an Artificial Intelligence Blueprint, whose objective is to outline the most relevant opportunities and challenges of the development and use of AI on the continent, and to make concrete policy recommendations to enable countries to maximise the potential while alleviating the risks associated with these technologies.[69]

In light of the above, countries such as South Africa, being a top technology hub within the region and boasting among the highest levels of innovation, are increasingly taking legal and regulatory measures to regulate the adoption and continued use of AI, as well as to tackle its concomitant effects on labour. Therefore, the following section of the chapter undertakes a legal and regulatory review of the regulation of AI in South Africa, as a case-study example. This review focuses primarily on the most significant legal and ethical issues emanating from the uptake and use of AI, that is to say privacy, IP protection, and employment concerns. The review is aimed at providing insights for policymakers in other African countries in terms of establishing appropriate legislative and policy frameworks to encourage the development of AI and derive the benefits therefrom.

13.3.1 *Case Study: Regulation of artificial intelligence in South Africa*

Over the past decade across industries in South Africa, there has been a substantial drive towards incorporating AI, both in the public and private sectors, including energy and large-scale mining.[70] Among other objectives, this drive is largely motivated by the

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67 ACHPR: 'Press Statement by the Special Rapporteur on Freedom of Expression and Access to Information in Africa, on the Occasion of International Day for Universal Access to Information'.

68 AU Press Release: 'African Digital Transformation Strategy'.

69 ALT Advisory (ALT.AI): 'AI Governance in Africa' at 6.

70 Cliffe Dekker Hofmeyr 'AI Regulation in South Africa and the global regulatory trends'.

need to streamline operations, analyse user behaviour and determine or predict potential purchasing behaviour for goods and services etc.[71] In the mining sector specifically, South Africa's Minister of Communications & Digital Technologies, Hon. Ntshavheni, in a 2021 speech, reiterated that the Department seeks to cooperate with mining, among other sectors, 'on the deployment of AI and robotics in their production environments also as part of eliminating mining disasters that cost human lives such as the one in Lily Mine in our Mpumalanga Province, where the remains of four (4) mine workers remain trapped underground'.[72] The express mention of the mining sector in this speech underscores the government's commitment to supporting the adoption and continued application of AI in mining activities.

In light of the fast pace of technological advancements in sectors such as energy and large-scale mining, there are growing concerns that South Africa, like many other countries on the continent, could be left behind in this new wave of AI.[73] These questions stem from the fact that there are existing gaps in AI-related legislation, thereby increasing vulnerability to IP, cyber security and privacy challenges. Nevertheless, with the advent of AI in various sectors, the gaps in the law could present opportunities to develop and adapt them to nuanced situations.

It is noteworthy that a key step towards formalising AI in South Africa is through the establishment of the Presidential Commission on the Fourth Industrial Revolution in 2019, which is mandated with assisting the government to leverage the opportunities presented by the 4IR.[74] Apart from building human capacity in the area of the 4IR, one of its other recommendations is to identify relevant policies, strategies and action plans that will position the country to become a competitive global player in the development of AI technologies, thereby further manifesting the government's commitment to the future of AI.[75] This role necessitates reviewing, amending or creating policy and legislation to enable the 4IR. Several questions relating to data protection, ownership of the IP rights created by the AI, and the effects on employment, arise with the advent of AI in economic sectors such as the energy and mining sectors, and require consideration.

(a) Protection of Personal Information Act, 2013[76]

AI systems tend to be vulnerable to data breaches and hacking, actions that pose cyber security and privacy issues, therefore leading to inquiries about whether existing legislation can sufficiently regulate these systems to avoid these and other legal and ethical challenges. These privacy considerations invoke the POPIA, which in turn gives effect to the constitutional right to privacy[77] by prescribing mandatory procedures and mechanisms for the handling and processing of personal information.

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71 Ibid.

72 Department of Communications and Digital Technologies: 'Minister Khumbudzo Ntshavheni: Artificial intelligence regulation while encouraging innovation'.

73 Telecommunication Development Sector (ITU-D): 'The ICT Development Index (IDI): conceptual framework and methodology'.

74 The Presidency, Republic of South Africa: 'President appoints Commission on Fourth Industrial Revolution'.

75 Ibid.

76 Act 4 of 2013 (POPIA).

77 Constitution of the Republic of South Africa, 1996 s 14.

POPIA safeguards the integrity and sensitivity of personal information, as it obligates entities to manage how they capture and store personal information, which must be within the framework set out in the Act.[78] From the outset, businesses, including energy and mining companies in South Africa, need to ensure their AI systems are compliant with POPIA in circumstances where the data they handle constitutes personal information. POPIA,[79] governing automated decision-making, is of paramount importance for AI systems. It protects parties or 'data subjects' (the person to whom the personal information relates), from being subjected to decisions that are based solely on automated decision-making, thus resulting in legal consequences for them.[80] For example, the provision prohibits a financial institution from making a decision either to grant or reject a loan application, based solely on the profile of the data subject created by the AI system. This provision applies unless one of the exceptions to the prohibition on automated decision-making stipulated under section 71(2) applies in this instance.

Another fundamental provision of POPIA,[81] is for AI system operators to obtain prior authorisation from the Information Regulator. This consent is required in the event that they intend to process any unique identifiers of data subjects either, 'for a purpose other than the one for which the identifier was specifically intended at collection', and 'with the aim of linking the information together with information processed by other responsible parties'.[82] Section 1 of the Act defines a 'unique identifier' as, 'any identifier that is assigned to a data subject and is used by a responsible party for the purposes of the operations of that responsible party and that uniquely identifies that data subject in relation to that responsible party',[83] for instance, an identity number or employee number.

Apart from the issue of privacy, another fundamental issue to consider in regulating AI relates to IP protection. Porto and Preiskel assert that AI systems could produce material that would ordinarily be protected by the relevant IP law of a country, had they been created by human beings.[84] Notably, the present IP legal framework in South Africa does not consider content created by AI systems, as is shown below.

(b) Intellectual property protection

In principle, intellectual property (IP) law encompasses four main sub-categories of rights and protections, including copyrights and patents. According to Professor Abbot: 'If outdated IP laws around the world don't respond quickly to the rise of the inventive machine, the lack of incentive for AI developers could stand in the way of a new era of spectacular human endeavour.'[85] However, existing IP laws, such as those in South Africa, could be interpreted or read in a manner to extend protection to AI systems.

In terms of copyright, the protection accorded by the South African Copyright Act,[86] does not require registration. Following section 2 thereof, copyright protection is

78 Act 4 of 2013 Preamble.
79 S 71(1).
80 Ibid.
81 S 57(1)(*a*).
82 Ibid.
83 S 1.
84 Porto N and Preiskei D 'United Kingdom Chapter' at 319.
85 Butler L 'World first patent applications filed for inventions generated solely by artificial intelligence'.
86 Act 98 of 1978.

provided for several classes of work such as artistic works, literary works, musical works etc. Unlike the UK's copyright legislation (that is to say Copyright, Designs and Patents Act[87]) which defines a computer-generated work as one that is 'generated by a computer in circumstances such that there is no human author of the work', there is no similar provision in South African copyright law for computer-generated works. The court in the leading *Haupt* case regarding the authorship and ownership of copyright, pronounced on this matter, finding that the literary works contemplated by the provision of the Act include databases, which are commonly created by AI algorithms.[88] Pursuant to this judgment, copyright protection could be extended to content created by AI systems, provided that they satisfy the overarching requirements of originality and materiality/ expression.[89]

With respect to patent protection, in 2021, South Africa through the South African Companies and Intellectual Property Commission (CIPC), became the first country in the world to grant a patent in which an AI system was identified as the inventor,[90] despite the country's Patents Act[91] not defining an 'inventor'. This matter dealt with inventions generated by the Device for the Autonomous Bootstrapping of Unified Sentience (DABUS) a type of AI system, culminated in consideration across various patent offices globally, as is explained below. The various issues emanating from this case have largely formed the basis of academic and policy discourses around AI and IP. Further, the ownership of a patent ordinarily rests with the inventor, therefore, following South Africa granting a patent for an AI system, it is expected that the country's Patents Act will be amended to allow the Patents Office to accept applications where the inventor is listed as a form of AI in the future.

The genesis of the DABUS case dates back to 2019 when a group of academics from the University of Surrey in the United Kingdom (UK), led by Abott, filed patent applications at different times across the world, including with the UK Intellectual Property Office (UKIPO), the European Property Office (EPO), the US Patent and Trademark Office (USPTO), the CIPC, the Australia Patent Office, and in the German Patent Office, for inventions generated by DABUS.[92] Each application named DABUS as the sole inventor, with the applicants alleging that this AI system generated inventions without human intervention.[93] These patent applications were eventually rejected in all the above patent offices except in South Africa, on the grounds that the concept of 'inventor' is exclusively limited to human beings, thus the applications were incomplete as they did not identify a human inventor.[94]

The CIPC in South Africa on the other hand, approved Thaler's (the owner of DABUS) patent application in 2021.[95] As a result, South Africa became the first country to grant

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87 Act of 1988 (CDPA) s 178.

88 *Haupt t/a Soft Copy v Brewer Marketing Intelligence (Pty) Ltd and Others* [2006] ZASCA 40; 2006 (4) SA 458 (SCA).

89 Copyright Act 98 of 1978 (South Africa) s 2.

90 Daniel L 'SA becomes the first country in the world to award a patent to an AI-generated invention'.

91 Act 57 of 1978.

92 Van Harmelen J 'Can AI invent? Courts around the world weigh in'.

93 Ibid.

94 Ibid.

95 CIPC: 'Inspection of Specifications' at 255 (No. 72).

a patent in which an AI system was identified as an inventor.[96] Advocating for a purposive interpretation whereby the provisions of the South African Patent Act ought to be construed broadly, Thaldar and Naidoo argue that the decision of the CIPC was correct, as it aligned with South Africa's public policy on AI.[97] They argue that the fact that South Africa has become the first jurisdiction in the world to allow AI inventorship should be hailed as 'progressive and pro-science'.[98] This development is an indication that policymakers may be willing to accept the ever-changing realities of technology and incorporate this realisation into the existing legal framework, to encourage innovation and assist in tackling socio-economic challenges.

Subsequently, with respect to Thaler's corresponding patent application in Australia, the Federal Court of Australia (FCA) seemingly endorsed the decision by the CIPC by confirming that DABUS was an inventor under the Australian Patent Act and its Regulations.[99] This judgment was following an application for judicial review of an earlier ruling by the Deputy Commissioner of the Australian Patent Office, where the initial patent application was made, which had found that the language of both the Australian Patent Act and Regulations were inconsistent with an application for a patent identifying an AI machine as an inventor.[100] The FCA in this case held that, in line with current technology and the need to promote innovation, an inventor under the Australian Patent Act could also be an AI system.[101]

In April 2022 however, the FCA, on appeal by the Commissioner of the Australian Patent Office, reversed its earlier decision above, finding that an inventor under Australian patent law, must be a natural person.[102] Therefore, the judge set aside the 2021 ruling of the Court, meaning that DABUS could not be regarded as an inventor, and thus is not eligible for a patent. A special leave to appeal to the High Court of Australia was later rejected in November 2022.[103] As is the case across the world, the question of whether AI can be recognised as an 'inventor' for the purposes of patent law in Australia, remains unsettled, and could potentially lead to further litigation and legislative action.

It is evident from the above discussion of the current regulation of AI that, since novel and innovative technologies such as AI advance at a very fast rate, the law tends to lag. However, regulators appear to have left the door open to considering granting patents to AI systems in the future. For instance, the UKIPO, in 2022 stated that it will need to 'understand how our IP system should protect AI-devised inventions in the future'.[104] It also undertook to advance international discussions on this issue, to ensure that the UK remains competitive and to guard against stifling innovation.[105] It is also noteworthy that leave to appeal to the UK Supreme Court was granted in August 2022,

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96 IPWatchdog: 'DABUS Gets Its First Patent in South Africa Under Formalities Examination'.
97 Thaldar DW and M Naidoo 'AI inventorship: The right decision?' at 2.
98 Ibid. 3.
99 *Thaler v Commissioner of Patents* [2021] FCA 879.
100 Ibid.
101 Ibid.
102 *Commissioner of Patents v Thaler* [2022] FCAFC 62.
103 Egbuonu K 'The latest news on the DABUS patent case'.
104 UKIPO: 'Consultation outcome: Artificial Intelligence and Intellectual Property: copyright and patents: Government response to consultation'.
105 Ibid.

and the appeal is scheduled to be heard in 2023.[106] Historically, legal developments in the UK, including in the area of IP, have had far-reaching implications and helped to shape legal developments in South Africa, therefore future changes to UK patent laws may influence changes in South African patent laws.

The exponential growth in the deployment of AI technologies across the African continent is testing the current regulatory landscape and raising novel legal and ethical issues that had not been contemplated previously. It is therefore imperative for African countries to enact and reform laws and policies to regulate the use of AI technologies to address existing gaps to safeguard their interests, as is explained below.

13.4 Existing gaps in the legal and regulatory framework for artificial intelligence on the African continent, and recommendations to address these gaps

Given the increasingly interconnected nature of the digital world today, there is a need for countries in Africa to coordinate and cooperate in AI regulation, especially for cross-border AI applications and data flows, which is presently lacking. During his tenure as the Chairperson of the African Union (AU), South African President, Cyril Ramaphosa advocated for a unified regional approach to AI, to serve as a blueprint for member states in devising laws and policies on AI.[107] By recognising the fact that African countries face common challenges, it becomes essential to employ common solutions that can be achieved through regionalism/regional integration to encourage a unified approach to dealing with AI and improving its regulation. Therefore, African countries can leverage the existing regional mechanisms, including regional economic blocks, to deploy, regulate and invest in AI across the energy and mining sectors.

13.4.1 *Gaps in policy formulation*

Concerning the mining sector, the AU adopted the Africa Mining Vision (AMV) in 2009, as the transformative roadmap towards the equitable, broad-based and inclusive development of the sector.[108] This vision, among other things, aims to ensure the maximisation and retention of the revenues from mining through local development mechanisms such as local content policies and curbing the haemorrhaging of resources through tax evasion and illicit financial flows (IFFs).[109] Additionally, it aims to advocate for the optimal development of mineral resources to encourage sustainable growth and socio-economic development in Africa,[110] promote industrialisation across the continent,[111] increase citizen participation in the sector,[112] improve revenue-sharing, enhance transparency through annual reporting on the part of mining companies, and safeguard the environment.[113] These objectives are also in line with the AU's Agenda 2063 Action

106 Williams M and Sibley L 'DABUS – Appeal to the UK Supreme Court allowed'.
107 ALT Advisory (ALT.AI) at 6.
108 AU: 'African Mining Vision'.
109 Ibid. at 12–14.
110 Ibid. at v.
111 Ibid. at 3.
112 Ibid. at 5.
113 Ibid. at 19.

Plan,[114] particularly relating to the goal of domestic resource mobilisation. Significantly for this chapter, the AMV, whose objectives influenced legal and regulatory frameworks through the enactment of laws and policies relating to mining across Africa, does not contain any express provisions to regulate AI, thereby further emphasising the gaps that exist in regulating these technologies within sectors on the continent.

Further, in 2019, the AU also called for a unified framework on AI to manage the benefits of these technologies for the continent.[115] Subsequently, the AU, in 2020, adopted the African Digital Transformation Strategy (DTS).[116] This strategy expressly recognised the need to create 'an enabling environment with policies and regulations that promote digital transformation to achieve the objectives of the strategy, which includes building skills and human capacity in emerging digital technologies such as AI.[117]

Secondly, in terms of IP protection and with respect to the CIPC's decision in South Africa concerning DABUS above, Oriakhogba opines that unless South African patent law is amended, or incorporates new rules to cater for the peculiar characteristics of AI 'inventors' such as DABUS, granting a patent on such applications that name AI systems as inventors will dismantle the human inventorship foundation.[118] This foundation is linked to the concepts of personhood and the subjective rights on which the South African patent regime is underpinned, that is to say the human-centred approach of South African patent law.[119] He further states that it is unlikely that the patent granted to DABUS will withstand muster upon judicial scrutiny, as it conflicts with sections 25(2) and (3), as well as section 27(1) of the South African Patent Act, read with other relevant provisions.[120] Therefore, this contention justifies the law being amended to incorporate new rules that would unequivocally regulate inventions by AI systems such as DABUS.

13.4.2 *Labour considerations*

Where local content provisions exist in mining legislation and policies, they tend to be vague, short term, impose merely superficial obligations on mining rights holders, and remain unenforced. To address these shortcomings, countries could adopt a model that is similar to the South African model whereby the state through the Mining Charter of 2018,[121] mandates mining rights and licence holders to invest 5% of their annual income (the leviable amount) into essential skills-development activities for their employees. From this investment, mine workers are able to access opportunities to develop their skills through learnerships, bursaries, internships and other forms of education, to enable them to retain their jobs amid the advent of AI and other novel

114 AU: 'Agenda 2063 Report of the Commission on the African Union Agenda 2063 The Africa We Want in 2063'.
115 AU Press Release: 'African Digital Transformation Strategy'.
116 Ibid.
117 Ibid.
118 Oriakhogba DO 'DABUS gains territory in South Africa and Australia: Revisiting the AI-inventorship question' at 98.
119 Ibid.
120 Ibid. at 108.
121 Broad-based Socio-Economic Empowerment Charter for the Mining and Minerals Industry, 2018 (Mining Charter, 2018) at 2.3.

technologies in the sector. Other African countries could borrow this approach by introducing more targeted skills development obligations that would see workers benefit even beyond the lifecycle of a mine.

Additionally, Nwogu asserts that considering the fact that automation in mining constitutes the potential substitution of human labour from mining operations with novel technologies, the current formulation of mining laws across the African continent does not envisage a situation whereby mines are operated by machines.[122] Most of these mining laws were enacted pursuant to the AU adopting the AMV in 2009. To address the lacuna in the law, Nwogu proposes either a revision or the enactment of new mining laws that are fully cognisant of the impacts of automation and that prioritise local content in terms of equipping people with the requisite skills for all phases of mining operations.[123] She further explains:

> 'The current language in these laws on technical training or knowledge transfer requirements may be empty of meaning in a future mining sector that will not only affect unskilled workers due to automation but also skilled workers because of machine learning.'[124]

Therefore, the local content provisions in mining-related legislation should not only provide for the employment of local or domestic workers, but also for training for these workers, to be responsive to the realities of automation in the sector.

Another measure for addressing the apparent lacuna in the law is by developing synergies between industry and policymakers to encourage more engagements between them as a means of ensuring that the legal and regulatory frameworks are responsive to the disruptive effects of automation,[125] particularly with the continued adoption and the realities of automation in the extractive industries generally. For instance, the perceived impacts that automation has on the labour force and employment in the extractive industries ought to be a key consideration in these engagements between the industry and governments across the continent to ensure that laws and policies continually protect the workforce.

13.5 Insufficient capacity and expertise

Additionally, another challenge in terms of regulating AI on the continent is insufficient capacity and expertise, as some African countries continue to face challenges in implementing AI policies effectively to address emerging issues. In the energy and mining sectors, inefficiencies regarding licensing, planning and overall management of the sectors are still very widespread across the continent.[126] Therefore, the lack of expertise in AI necessitates further investment into research and development (R&D), and capacity building within countries to support initiatives that are already in place through research hubs and other private-sector efforts.

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122 Nwogu NV 'Mining at the Crossroads of Law and Development: A Comparative Review of Labor-Related Local Content Provisions in Comparative Review of Labor-Related Local Content Provisions in Africa's Mining Laws Through the Prism of Automation Africa's Mining Laws through the Prism of Automation' at 148.

123 Ibid. at 155.

124 Ibid. at 152.

125 Erdélyi and Goldsmith at 12.

126 Nalule VR *Energy poverty and access challenges in sub-Saharan Africa: The role of regionalism* at 27.

It is imperative for governments to implement their AI strategies to address the existing gaps in regulation, without stunting the growth and development of these technologies. Striking this balance is an issue that countries are grappling with and are taking measures to address.[127] For example, with reference to the position in South Africa above, fundamental issues related to IP rights in AI inventions, and algorithms are not comprehensively addressed in some legal systems, thus could hinder innovation and limit the development of AI technologies on the continent.

According to the Centre for Strategic & International Studies, in 2021, the number of tech hubs on the continent had grown by 50% over the past several years, amounting to more than 600 hubs.[128] Consequently, African governments must create enabling environments, through policy and other measures, for the already existing AI research hubs. For example, Google's AI lab in Ghana that was opened in 2019, which provides developers with the requisite research to build products that could solve Africa's unique problems;[129] as well as the proliferation of AI start-ups across the African continent, to thrive and accelerate the socio-economic development of Africa. Other multinational technology giants, including IBM Research, Microsoft, and Amazon, have also recently established research labs on the continent.[130]

Progress made in regulation by the EU serves as an appropriate reference point for governments across the African continent, to assist them in creating robust and proactive regulatory approaches to the AI revolution. This is particularly relevant and useful in the context of data use and management. This assertion finds support from a 2022 report by Alt AI,[131] which comprises a collective African public interest lawyers, researchers, and technologists working towards positive social change across the continent Africa, and globally. They expressed the fact that there is an increasingly growing body of research and policy work, both regionally and internationally that provides fundamental guidance and standards for African countries to ensure the appropriate governance of AI technologies.[132]

Moreover, following their submission to the European Commission (EC) regarding the White Paper on Artificial Intelligence of 2020, Kerry et al. explain that together with the US, the EU could provide a model globally relating to the governance of AI.[133] It is in light of this that the following section of this chapter addresses the extent to which the regulation of AI in the EU is relevant for the African continent, focusing on the aspects of data protection (including the use and management of such data), and international law principles to the extent that they would guide policymaking on AI. It recognises the dangers of adopting a one-size-fits-all approach to regulation, owing to the different contexts between countries and regions. Whereas the specific provisions of EU provisions relating to the regulation of AI may not be directly applicable to African countries, several principles could serve as a reference point for countries seeking to develop or strengthen their own AI laws.

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127 Erdélyi and Goldsmith at 1.
128 Devermont J and Harris M 'Digital Africa: Leveling Up through Governance and Trade'.
129 See Effoduh.
130 See Candelon, El Bedraoui and Maher.
131 See ALT Advisory (ALT.AI).
132 Ibid. at 13.
133 Kerry CF et al. 'Strengthening international cooperation on artificial intelligence'.

13.6 Extent to which the regulation of artificial intelligence in the European Union is relevant for the African continent to address existing policy gaps

Together with the US, the EU has established itself as a global leader in AI regulation,[134] thereby carrying fundamental lessons for African policymakers in the development and strengthening of their own laws and policies to regulate AI. African nations are grappling with how to draft AI law, since it is an advanced and dynamic technology that policymakers lack the requisite expertise to regulate. As a result, they should embrace certain fundamental provisions and principles that emanate from the EU's existing framework and policies related to AI.

In terms of data protection, the EU is renowned for being the most proactive in proposing new rules and regulations in terms of data protection and new technologies.[135] The General Data Protection Regulation,[136] which specifically relates to the issue of privacy, is one of several initiatives by the EU in the context of its digital strategy. has thus far been applied across EU member states since 2018, and is thought to be the blueprint for regulating the digital sector and harmonising data-protection laws across the region.[137] This policy document introduced a new era of data-protection law by setting a high threshold for countries within that region. The relevant provisions of the GDPR can serve as a guide for African countries in formulating and strengthening their data-protection laws and policies.

Article 5 of the GDPR proposes seven overarching guiding principles for data collection and processing, including the requirement that data must be guided by the principles of lawfulness, fairness and transparency. The other guiding principles for data collection and processing stipulated under Article 5 are the following: personal data should be collected for specified, explicit and legitimate purposes and must not be processed in a way that is incompatible with those purposes; personal data must be limited to what is necessary. It also stipulates that the data needs to be accurate and regularly updated; personal data should be kept for the stated period and no longer than necessary; the data should be kept secure; and, the respective data controller is responsible for ensuring their compliance with the GDPR. Despite the above guidelines, African countries need to tailor their data protection and privacy frameworks to consider their unique contexts, challenges, resources and priorities.

Additionally, the requirement in the GDPR that data must be guided by the principles of lawfulness, fairness and transparency constitute a fundamental part of international law, therefore they can serve as a basis for African countries to develop their AI laws and policies. These laws and policies would apply specifically to the energy and mining sectors. By considering the approach adopted by the EU, as a form of international best practice, countries within the African continent would benefit from the lessons learned and avoid potential challenges in adopting AI technologies that could violate individual rights and other ethical considerations. Also, the regulation in the EU seeks to promote harmonisation in regulating AI, by establishing global norms and

134 Erdélyi and Goldsmith at 8.
135 Ibid.
136 GDPR Regulation (EU) 2016/679.
137 Ibid.

standards. Therefore, this collaboration could foster capacity building, and technology transfer, and establish partnerships to strengthen their AI capabilities.

Another key feature of the AI regulation regime introduced by the GDPR is that the regulation system across the EU is designed around the view that citizens within this region have an actionable right to privacy. Despite not expressly mentioning AI, it is evident that many of its provisions are relevant to AI systems and have had a wide-ranging influence on the AI strategies of countries in that region.

Although there are several areas of convergence between the regulation of AI in the EU and within the African continent, African countries need to tailor their laws and policies, taking into account their different contexts, circumstances and priorities. Nevertheless, it is expected that new regulations relating to AI will incorporate different principles and requirements that will be influenced by the regulation of AI in the EU, as discussed above.

13.7 Conclusion

AI has already proved to be crucial for economies, as different African countries have benefited from its deployment in the different sectors of the economy, including in the energy and mining sectors. In these sectors specifically, AI has not only improved their productivity, it has also helped to address some of their unique challenges.

In terms of regulation, the current developments indicate that governments across the continent are actively recognising that regulation and oversight are critical with regard to AI systems. The chapter acknowledges that various frameworks that regulate the application of AI on the African continent already exist. However, they do not fully address the unique aspects of digitalisation and, therefore require to be strengthened/improved to properly regulate and facilitate the increased deployment of AI technologies across economic sectors such as energy and mining.

13.8 References

ABB: 'ABB uses AI to revolutionize energy management' <https://new.abb.com/news/detail/41194/abb-uses-ai-to-revolutionize-energy-management>.

ACHPR: 'Press Statement by the Special Rapporteur on Freedom of Expression and Access to Information in Africa, on the Occasion of International Day for Universal Access to Information' (28 September 2022) <https://www.achpr.org/pressrelease/detail?id=656>.

ALT Advisory (ALT.AI): 'AI Governance in Africa: An overview of regulation and policy work on Artificial Intelligence in Africa' (2022) Report https://ai.altadvisory.africa/wp-content/uploads/AI-Governance-in-Africa-2022.pdf.

AngloAmerican: 'FutureSmart Mining' https://www.angloamerican.com/futuresmart/futuresmart-mining.

Atif I, Cawood FT and Mahboob MA 'The role of digital technologies that could be applied for prescreening in the mining industry during the COVID-19 pandemic' *Transactions of the Indian National Academy of Engineering* 5(4) (December 2020) at 663–674.

AU: 'African Mining Vision' (February 2009) <https://au.int/en/documents/20100212/africa-mining-vision-amv>.

AU: 'Agenda 2063 Report of the Commission on the African Union Agenda 2063 The Africa We Want in 2063' (2015) <https://au.int/en/agenda2063/overview>.

AU Press Release: 'African Digital Transformation Strategy and African Union Communication and Advocacy Strategy among major AU initiatives in final declaration of STCCICT3' (26 October 2019) <https://au.int/sites/default/files/pressreleases/37592-pr-stc_pr-1-5.pdf>.

Bensoussan A and Bensoussan J (eds) *Comparative Handbook: Robotic Technologies Law* (Larcier, 2016).

Broad-based Socio-Economic Empowerment Charter for the Mining and Minerals Industry, 2018 (Mining Charter, 2018).

Butler L 'World first patent applications filed for inventions generated solely by artificial intelligence' (2019) <https://www.surrey.ac.uk/news/world-first-patent-applications-filed-inventions-generated-solely-artificial-intelligence>.

Candelon F, El Bedraoui H and Maher H 'Developing an Artificial Intelligence for Africa Strategy' (2021) <https://oecd-development-matters.org/2021/02/09/developing-an-artificial-intelligence-for-africa-strategy/>.

CIPC: 'Inspection of Specifications' *Patent Journal including Trade Marks, Designs and Copyright in Cinematograph Films* (July 2021) Part II Vol. 54 No. 7 255 (No. 72).

Cliffe Dekker Hofmeyr 'AI Regulation in South Africa and the global regulatory trends' (2019) <https://www.cliffedekkerhofmeyr.com/en/news/publications/2019/technology/tmt-alert-1-july-ai-regulation-in-south-africa-and-the-global-regulatory-trends.html> (accessed 6 February 2022).

CSIR: <https://www.csir.co.za/renewable-energies>.

Cuffari B 'Syama: The First Fully Automated Mine' (2019) <https://www.azomining.com/Article.aspx?ArticleID=1519>.

Daniel L 'SA becomes the first country in the world to award a patent to an AI-generated invention' (2021) <https://www.businessinsider.co.za/south-africa-first-in-the-world-to-award-an-ai-patent-2021-8>.

De Beers Group: 'De Beers group introduces world's first blockchain-backed diamond source platform at scale' (2022) <https://www.debeersgroup.com/media/company-news/2022/de-beers-group-introduces-worlds-first-blockchain-backed-diamond-source-platform-at-scale>.

Delve: 'State of the Artisanal and Small-Scale Mining Sector' (2020) Report <https://delvedatabase.org/uploads/resources/Delve-2020-State-of-the-Sector-Report-0504.pdf>.

Department of Communications and Digital Technologies: 'Minister Khumbudzo Ntshavheni: Artificial intelligence regulation while encouraging innovation' (2021) <https://www.gov.za/speeches/minister-khumbudzo-ntshavheni-remarks-artificial-intelligence-ai-regulation-while>.

Devermont J and Harris M 'Digital Africa: Leveling Up through Governance and Trade' (2021) <https://www.csis.org/analysis/digital-africa-leveling-through-governance-and-trade>.

EDP Renewables: 'What we do: Wind energy' <https://www.edp.com/en/what-we-do/wind-energy>.

Effoduh JO ‘7 Ways that African States are Legitimizing Artificial Intelligence’ (2020) <https://openair.africa/7-ways-that-african-states-are-legitimizing-artificial-intelligence/>

Egbuonu K ‘The latest news on the DABUS patent case’ (2022) <https://www.ipstars.com/NewsAndAnalysis/The-latest-news-on-the-DABUS-patent-case/Index/7366>.

Erdélyi OJ and Goldsmith J ‘Regulating Artificial Intelligence: Proposal for a Global Solution’ *Government Information Quarterly* (2022) 39.

Finlay A (ed.) *Artificial Intelligence: Human rights, social justice and development* (APC, 2019).

Fu Y and Aldrich C ‘Deep Learning in Mining and Mineral Processing Operations: A Review’ (2020) *FAC PapersOnLine* 53-2.

GAO Report: ‘Artificial Intelligence: An Accountability Framework for Federal Agencies and Other Entities’ (2021) <https://www.gao.gov/assets/gao-21-519sp.pdf>.

Global RC ‘Blockchain for traceability in minerals and metals supply chains: Opportunities and challenges’ 1(1) (Self published, 2017) 1–21.

IEA: ‘Digitalization and Energy’ (2017) <https://iea.blob.core.windows.net/assets/b1e6600c-4e40-4d9c-809d-1d1724c763d5/DigitalizationandEnergy3.pdf>.

IPWatchdog: ‘DABUS Gets Its First Patent in South Africa Under Formalities Examination’ (2021) <https://ipwatchdog.com/2021/07/29/dabus-gets-first-patent-south-africa-formalities-examination/id=136116/>.

IRENA: ‘Off-grid renewable energy solutions to expand electricity access: An opportunity not to be missed’ (2019) <https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/ IRENA_Off-grid_RE_Access_2019.pdf>.

Kiemde SMA and Kora AD ‘Towards an ethics of AI in Africa: rule of education’ *AI and Ethics* (2022) Vol. 2 No. 1 35–40.

Leel H and Clark A ‘Charging the Future: Challenges and Opportunities for Electric Vehicle Adoption’ (Harvard Kennedy School: Faculty Research Working Paper Series, 2018) <https://projects.iq.harvard.edu/files/energyconsortium/files/rwp18-026_lee_1.pdf>.

Marot A, Rozier A, Dussartre M, Crochepierre L and Donnot B ‘Towards an AI Assistant for Power Grid Operators’ in Schlobach S et al. (eds) *Augmenting Human Intellect*.

Kerry CF, Meltzer JP, Renda, A, Engler A and Fanni R ‘Strengthening international cooperation on artificial intelligence’ (2021) <https://www.brookings.edu/articles/strengthening-international-cooperation-on-artificial intelligence/> (accessed 17 August 2023).

Minexx: ‘Connecting Miners to the World’ <https://minexx.co/>.

Mining Weekly: ‘Sibanye-Stillwater appoints DataProphet to implement an AI powered plant optimisation system’ (2019) <https://www.miningweekly.com/article/sibanye-stillwater-appoints-dataprophet-to-implement-an-ai-powered-plant-optimisation-system-2019-03-20>.

Mining Weekly: ‘Weighing up renewable energy’ (2023) <https://www.miningweekly.com/ article/careful-consideration-of-renewables-in-mining-needed-2023-09-01>.

Miteva S ‘The Future of Innovative Smart Grid Technologies’ (2021) <https://www.valuer.ai/blog/innovative-smart-grid-technologies-for-the-future>.

Mosweu O and Rakemane D 'The role of records management in ensuring good governance in Africa' *Journal of the South African Society of Archivists* 53 (16 December 2020)103–123.

Nalule V and Acheampong T 'Energy Transition Indicators in African Countries: Managing the Possible Decline of Fossil Fuels and Tackling Energy Access Challenges' *Journal of Sustainable Development Law and Policy* (2021) 12(1).

Nalule VR *Energy poverty and access challenges in sub-Saharan Africa: The role of regionalism* (Springer, 2018).

Nalule VR *Mining and the Law in Africa: Exploring the social and environmental impacts* (Springer Nature, 2019).

Newman N 'AI: the energy industry's untapped resource' (2019) <https://eandt.theiet.org/content/articles/2019/07/ai-the-energy-industry-s-untapped-resource/>.

Nwogu NV 'Mining at the Crossroads of Law and Development: A Comparative Review of Labor-Related Local Content Provisions in Comparative Africa's Mining Laws through the Prism of Automation' *Washington International Law Journal* Vol. 1 No. 1 (2019).

Onuoha R 'Africa – AI in Africa: Regional Data Protection and Privacy Policy Harmonisation' in Finlay A (ed.) *Artificial Intelligence: Human rights, social justice and development*.

Oriakhogba DO 'DABUS gains territory in South Africa and Australia: Revisiting the AI-inventorship question' *South African Intellectual Property Law Journal* (2021).

Paredes D and Fleming-Munoz D 'Automation and robotics in mining: Jobs, income and inequality implications' *The Extractive Industries and Society* (2021).

Porto N and Preiskel D 'United Kingdom Chapter' in Bensoussan A and Bensoussan J (eds) *Comparative Handbook: Robotic Technologies Law* (Larcia, 2016).

PowerGen Renewable Energy <https://www.powergen-renewable-energy.com/>.

Powerhive: 'About' <https://www.powerhive.com/>.

Rensource Energy: 'Rensource Energy Announces 1.4 MW of New Projects for 2023' <https://rensource.energy/>.

Rio Tinto: 'Smart Mining' (2021) <https://www.riotinto.com/en/about/innovation/smart-mining>.

Sanchez F and Hartlieb P 'Innovation in the Mining Industry: Technological Trends and a Case Study of the Challenges of Disruptive Innovation'

Schlobach S et al. (eds) *Augmenting Human Intellect* (IOS Press, 2022).

Schmelzer R 'AI Helping Extract Value In The Mining Industry' (2019) <https://www.forbes.com/sites/cognitiveworld/2019/08/09/ai-helping-extract-value-in-the-mining-industry/?sh=738e5cd97006>.

Signé L 'Digitalizing Africa's mines' (2021) <https://www.brookings.edu/articles/digitalizing-africas-mines/>.

Stanford University: 'AI Tools in Teaching and Learning' (2023) <https://teachingcommons.stanford.edu/news/ai-tools-teaching-and-learning>.

Strathmore University CIPIT Report: 'The State of AI in Africa Report 2023' <https://cipit.strathmore.edu/wp-content/uploads/2023/05/The-State-of-AI-in-Africa-Report-2023-min.pdf>.

Study of the Challenges of Disruptive Innovation (2020) *Mining, Metallurgy & Exploration* 37:1385–1399.

Tahini AAl 'From 4IR to hydrogen: How technology can accelerate the move toward low-carbon economies' < https://www.worldoil.com/magazine/2021/october-2021/features/from-4ir-to-hydrogen-how-technology-can-accelerate-the-move-toward-low-carbon-economies > .

Telecommunication Development Sector (ITU-D): 'The ICT Development Index (IDI): conceptual framework and methodology' (2017) < https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017/methodology.aspx > .

Thaldar DW and M Naidoo 'AI inventorship: The right decision?' *South African Journal of Science* Vol. 117 No. 11–12 (2021).

The Presidency, Republic of South Africa: 'President appoints Commission on Fourth Industrial Revolution' (2019) < https://thepresidency.gov.za/press-statements/president-appoints-commission-fourth-industrial-revolution > .

TS Golosinki 'Use of the Internet and Information Technology in Mining' (Conference Paper, 17th International Mining Congress and Exhibition of Turkey, 2001) < https://www.maden.org.tr/resimler/ekler/109af321d970c64_ek.pdf > .

UKIPO: 'Consultation outcome: Artificial Intelligence and Intellectual Property: copyright and patents: Government response to consultation' (2022) < https://www.gov.uk/government/consultations/artificial-intelligence-and-ip-copyright-and-patents/outcome/artificial-intelligence-and-intellectual-property-copyright-and-patents-government-response-to-consultation > .

UNFCCC: 'Paris Agreement' (2015) < https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf > .

Van Harmelen J 'Can AI invent? Courts around the world weigh in' (2022) < https://www.ensafrica.com/news/detail/6024/can-ai-invent-courts-around-the-world-weigh-i > .

Verweij G and Rao A (PwC) 'Sizing the prize: what's the real value of AI for your business and how can you capitalise?' (2017) < https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf > .

Walker J 'AI in Mining – Mineral Exploration, Autonomous Drills, and More' (2019) < https://emerj.com/ai-sector-overviews/ai-in-mining-mineral-exploration-autonomous-drills/ > .

WEF: 'Why artificial intelligence is key to renewable energy grid resilience' (2021) < https://www.weforum.org/agenda/2021/03/artificial-intelligence-is-key-to-grid-resilience/ > .

WEF: White Paper: 'Digital Transformation Initiative: Mining and Metals Industry' (2017) < https://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/wef-dti-mining-and-metals-white-paper.pdf > .

Williams M and Sibley L 'DABUS – Appeal to the UK Supreme Court allowed' (2022) < https://www.marks-clerk.com/insights/news/dabus-appeal-to-the-uk-supreme-court-allowed/ > .

Wisskirchen G, Biacabe BT, Bormann U, Muntz A, Niehaus G, Soler GJ and Von Brauchitsch B 'Artificial Intelligence and Robotics and Their Impact on the Workplace' (IBA Global Employment Institute, 2017) < https://www.researchgate.net/profile/Mohamed-Mourad-Lafifi/post/Social_Robots_or_robots_with_social_functions/

attachment/6001ed617e98b40001bc005a/AS%3A980324746031116%40161073904 1600/download/AI-and-Robotics-IBA-GEI-April-2017.pdf>.

Zhang L, Pan Y, Wu X and Skibniewski MJ *Artificial Intelligence in Construction Engineering and Management*' Lecture Notes in Civil Engineering Vol. 163 (Springer, 2021).

Chapter 14

Agriculture in Africa: The emerging role of artificial intelligence

14.1 Introduction

This chapter critically considers the application of artificial intelligence (AI) to agriculture in Africa. It contends that, while African countries can utilise AI to address agricultural challenges, realising the full potential of AI in agriculture requires the judicious adaptation of pervasive AI technologies to serve African interests. Africa's young, vibrant population along with the movement of people, goods and services around the continent, promoted under the African Union's (AU) Agenda 2063 provide a fecund platform for AI-driven agricultural transformation. This is pivotal because of the multilayered agricultural paradoxes on the continent. For instance, Africa is endowed with an abundance of uncultivated arable land and diverse agro-ecological zones, from rainforest vegetation to dry and arid vegetation, which engender the growth of wide-ranging food and cash crops, yet it suffers an alarming increase in food insecurity.[1] An AU, United Nations (UN) Economic Commission for Africa (UNECA) and Food and Agriculture Organisation of the UN (FAO) Report on Food Security and Nutrition in Africa confirmed that 281.6 million people on the continent, comprising one-fifth of the population, faced hunger in 2020;[2] 346.4 million Africans suffered from severe food insecurity while 452 million suffered from moderate food insecurity in the same year.[3]

The food insecurity crisis in Africa is triggered by a plethora of factors, including conflicts, climate change, crop diseases, soil degradation, population growth, and economic volatility.[4] In addition, the coronavirus disease (Covid-19 pandemic) along with national measures undertaken to tackle it, precipitated economic downturns and disrupted activities in African agricultural sectors.[5] These multifaceted factors, exacerbated by inequalities, inadequate agricultural financing, inadequate research and development (and inadequate application of research and development), poverty, poor infrastructure and inappropriate laws and policies, compound the food insecurity crisis

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1 GNAFC and FSIN: '2022 Global Report on Food Crises: Joint Analysis for Better Decisions' at 20–25.

2 FAO, UNECA and AUC: 'Africa – Regional Overview of Food Security and Nutrition: Statistics and Trends' at 2.

3 Ibid.

4 Gebre GG and Rahut DB 'Prevalence of Household Food Insecurity in East Africa: Linking Food Access with Climate Vulnerability' at 1–15; GNAFC and FSIN: '2022 Global Report on Food Crises' at 25; Awange J *Food Insecurity and Hydroclimate in Greater Horn of Africa: Potential for Agriculture Amidst Extremes*.

5 Ezirigwe J et al. 'COVID-19/Food Insecurity Syndemic: Navigating the Realities of Food Security Imperatives of Sustainable Development Goals in Africa' at 129–162.

in Africa. Despite the AU and African Development Finance Institutions' agricultural initiatives, Africa is not poised to meet the Sustainable Development Goal (SDG) 2 along with its targets to end hunger, ensure access by all people to safe, nutritious and sufficient food all year round, and end all forms of malnutrition by 2030.[6]

Agriculture provides not only food but also a vital source of livelihood for the majority of female and male small-scale farmers in rural parts of Africa. In addition, it provides the raw materials required to produce primary products, ranging from biofuels, and clothing to pharmaceuticals. Presented in six parts, this chapter analyses Africa's agricultural landscape alongside nascent AI developments. Following the introduction in the first part, the second part examines some of the crucial threats to agricultural production in Africa. The third part unpacks the role of AI in tackling threats to agricultural production in Africa. The fourth and fifth parts map the AU's agriculture and AI-related laws and policies respectively. In discussing the future of agriculture in Africa, the sixth part concludes with a succinct synthesis of the core analysis along with pertinent calls to action.

14.2 Threats to agricultural production in Africa

Before the advent of European maritime traders and the colonisation of Africa, African countries had sophisticated, sustainable and resilient agricultural systems that safeguarded food sovereignty and food security.[7] European imperialism radically disrupted Africa's traditional agricultural trajectory.[8] External disruptions during colonisation introduced industrial agriculture that focused on a few export crops from the early nineteenth century, such as cocoa, coffee, cotton and palm oil, which displaced staple crops adapted to local socio-ecological landscapes and limited agrarian livelihoods.[9] In particular, industrial agriculture triggered multiplex detrimental environmental problems, including increased soil degradation, release of greenhouse gases (GHGs), deforestation, decline in agricultural biodiversity, emergence of novel plant pests/diseases and reliance on chemical inputs.[10]

Post-colonial Africa has not recovered from these external disruptions, although they now materialise differently. Contemporary avenues of external disruptions include international, regional, or bilateral treaty obligations, sovereign debt conditionalities,

6 FAO, IFAD, UNICEF, WFP and WHO: 'The State of Food Security and Nutrition in the World 2022: Repurposing Food and Agricultural Policies to make Healthy Diets more Affordable'; Fonjong LN and Gyapong AY 'Plantations, Women and Food Security in Africa: Interrogating the Investment Pathway towards Zero Hunger in Cameroon and Ghana' at 138; AfDB: 'Feed Africa: A Strategy for Agricultural Transformation in Africa 2016–2025'; AU: 'Linking Agenda 2063 and the SDGs'.

7 Thorton J 'Precolonial African Industry and the Atlantic Trade, 1500–1800' at 1–19, Inikori J 'The Development of Commercial Agriculture in Pre-Colonial West Africa'.

8 See generally Arewa OB *Disrupting Africa: Technology, Law, and Development*.

9 Bjornlund V, Bjornlund H and Van Rooyen AF 'Why Agricultural Production in Sub-Saharan Africa Remains Low Compared to the Rest of the World: A Historical Perspective' at S20–S53.

10 Tongwane MP and Moeletsi ME 'A Review of Greenhouse Gas Emissions from the Agriculture Sector in Africa' (2018) at 124–134, Graham S, Ihli H J and Gassner A 'Agroforestry, Indigenous Tree Cover and Biodiversity Conservation: A Case Study of Mount Elgon in Uganda' at 1893–1911; Ntiamoah EB et al. 'Estimating and Mitigating Greenhouse Gas Emissions from Agriculture in West Africa: Does Threshold Matter?' at 1–29.

foreign investment terms, economic partnership agreement provisions along with western-styled agricultural capacity building, technology/green revolutions and training. These external disruptions promote western-style agriculture that engender the gradual loss of African traditional agricultural knowledge and limit African farmers' ability to employ traditional tools, technologies and practices that can tackle threats to their agricultural production. This part discusses three interrelated threats to agricultural production in post-colonial Africa: climate change, crop diseases and pests, and soil degradation as exemplars of threats that can be tackled with AI as covered in the third part.

14.2.1 *Climate change*

Climate change threatens everyday lives in different sectors across Africa, including agriculture.[11] The Intergovernmental Panel on Climate Change (IPCC) in its Sixth Assessment Report asserts that human activities have warmed the climate at unprecedented rates.[12] According to the IPCC, atmospheric carbon dioxide (CO_2) concentrations were higher in 2019 than anytime in at least 2 million years.[13] The concentration of methane (CH_4) and nitrous oxide (N_2O) were also higher in 2019 than at any time in at least 800,000 years.[14] Special Reports in the Sixth IPCC Assessment Cycle estimate that agriculture, forestry and other land use (AFOLU) activities accounted for about 13% of CO_2, 44% of CH_4, and 82% of N_2O from human activities between 2016 and 2019, which represented 23% of the total net anthropogenic emissions of GHGs.[15] Despite climate mitigation measures, global temperatures are predicted to rise by at least 1.5 ^{o}C to 2 ^{o}C above pre-industrial levels in the 21st century.[16]

Human agriculture-related activities that contribute to climate change include deforestation and livestock breeding for food consumption.[17] Deforestation resulting from the process of clearing land for agricultural purposes contributes to global methane production leading to the loss of abilities of forests and trees to store carbon. When forests are completely cleared or degraded by fire, the stored carbon has the potential to be released back into the atmosphere as carbon dioxide. Furthermore, methane is produced by livestock during digestion due to enteric fermentation and it is released through belches.[18] For instance, a cow belches about 220 pounds of methane every year. Methane is also released from stored manure and organic waste in landfills, which contribute to global warming.[19]

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11 Lyam PT et al. 'Genetic Diversity and Distribution of Senegalia senegal (L.) Britton under Climate Change Scenarios in West Africa' at 1–20; Ampaire et al. 'Gender in Climate Change, Agriculture, and Natural Resource Policies: Insights from East Africa' at 43–60; Alemaw BF and Matondo JI 'Overview of Climate Variability and Change in Africa: Perspectives and Experiences' at 3–8.

12 IPCC: 'Climate Change 2021: The Physical Science Basis'.

13 Ibid.

14 Ibid.

15 Ibid.

16 Ibid.

17 Epule TE et al. 'A New Index on Agricultural Land Greenhouse Gas Emissions in Africa' at 598–613.

18 Iyiola-Tunji AO et al. 'Dual Pathway Model of Responses Between Climate Change and Livestock Production' at 523–533.

19 Ibid.

Real-world effects of climate change such as intensified and frequent heavy precipitation and associated flooding alongside droughts have unfolded around Africa as predicted in the aforementioned IPCC Report.[20] For example, in January 2022, Tropical Storm Ana resulted in the damage to agricultural lands and loss of crops in Madagascar, Malawi, Mozambique, Zambia and Zimbabwe; the storm circulated through heavy rains and floods.[21] Similarly, in March 2019, Tropical Cyclone Idai that ravaged Southern African countries, including Madagascar, Malawi, Mozambique, and Zimbabwe, wiped out agricultural lands and halted food production; it circulated through strong winds, heavy rains and severe floods.[22] Meanwhile, countries in the Horn of Africa, including Ethiopia, Kenya and Somalia suffered severe droughts in 2021; failed rainy seasons and shortages of water caused loss of crops and livestock.[23] These vicissitudes in weather conditions resulting in interruptions to agricultural production and low agricultural yields remain core future threats to agricultural production in many countries across Africa.

14.2.2 *Crop diseases and pests*

The FAO estimates that about 40 % of worldwide crops are lost to diseases and pests.[24] Crop diseases and pests can spread through environmental forces (such as weather and wind), insects (or other vectors), trade and human migration/movements.[25] Some of the common plant pests and diseases in Africa include cassava mosaic disease or brown streak, desert locust and wheat rusts. Cassava (*Manihot esculenta*) is mostly produced by small-scale farmers in the humid and semi-humid tropics.[26] Africa accounts for more than 50 % of the global cassava production and about 70 million Africans depend on cassava as their primary source of food. Cassava is popular across Africa because of its resilient and versatile characteristics. For instance, it can grow successfully in wide-ranging agro-ecological zones, it produces higher yields per unit of land (more than other crops such as maize, yams, wheat or rice), it is tolerant to drought, and it can produce yields even on depleted lands. In addition, it is vegetatively propagated (farmers can replant their cuttings), and it does not require the extensive use of chemical inputs (such as fertilisers). Cassava can be eaten fresh and in various processed forms (such as cassava flour and *garri* which are popular in Nigeria). In parts of Africa, especially East Africa, cassava leaves are consumed as green vegetables. The cassava mosaic

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20 IPCC: 'Climate Change 2021: The Physical Science Basis'.

21 Mushtaq F et al. *A Rapid Geospatial Analysis of the Impact of Tropical Storm Ana in Madagascar, Malawi, Mozambique, Zambia and Zimbabwe* at 5–7.

22 Tevera D et al. 'Assessment of Cyclone Idia Floods on Local Food Systems and Disaster Management Responses in Mozambique and Zimbabwe' at 59–68; Mutasa C 'Revisiting the Impacts of Tropical Cyclone Idai in Southern Africa' at 175–189.

23 Seife TK 'The Impact of Climate Change on Agriculture and Food Security in the Greater Horn of Africa' at 98–114; Wassie SB, Mengistu DA and Birlie AB 'Agricultural Drought Assessment and Monitoring using MODIS-based Multiple Indices: The Case of North Wollo, Ethiopia' at 787–812.

24 IPPC Secretariat: 'Scientific Review of the Impact of Climate Change on Plant Pests: A Global Challenge to Prevent and Mitigate Plant-Pest Risks in Agriculture, Forestry and Ecosystems'.

25 Oerke EC 'Crop Losses to Pests' at 31–43; Sharma S, Kooner R and Arora R 'Insect Pests and Crop Losses' at 45–66.

26 Ceballos H et al. 'Cassava' at 53–96.

disease produces foliar symptoms including mosaic patterns, mottling, twisted leaflets, and a reduction in the size of leaves and plants.[27]

Desert locusts (*Schistocerca gregaria*) destroy agricultural production and engender food loss across Africa.[28] Desert locusts are the most destructive migratory pest in the world. A locust can devour about 2 grams of plants every day, which is equal to its own weight. As desert locusts migrate in swarms, one million desert locusts can devour about one tonne of food every day; large swarms devour even more. A single swarm can have 80 million desert locusts, travel up to 90 miles a day and eat the same amount of food per day as 35,000 people. Indeed, the desert locust is one of the most dangerous locust pests because of the ability of its swarms to fly across great distances. Desert locusts consume almost all crop and non-crop plants including barley, cotton, maize, millet, pasture grasses, rice, sorghum, sugarcane, and vegetables. During plagues, desert-locust invasions destroy and limit agricultural harvests that would have been produced to feed humans. Driven by anthropogenic climate change and increased climate variability, there was a desert-locust upsurge between 2019 and 2021 in parts of the Horn of Africa.[29] In particular, in December 2020, there were huge desert-locust swarms around Kenya, coming up to 60 kilometres wide in certain instances, with the potential to eat million tonnes of cereals meant for human consumption.[30]

Wheat rusts (leaf or brown rust of wheat) caused by *Puccinia triticina* (Pt) is widely circulated across Africa and other wheat producing regions.[31] Wheat (*Triticum aestivum* L.) and wheat products are increasing significantly in Africa as they comprise part of the staple foods in many countries around the region. While African countries such as Ethiopia, Kenya, Nigeria, South Africa, Sudan, Zambia and Zimbabwe produce wheat, Africa is also a major importer of wheat.[32] Diseases are major contributors to low wheat yields. In particular, wheat rusts spread rapidly and reduce the yield and quality of the wheat. Factors that contribute to wheat-rust infections include the climate (such as drought, precipitation, wind, temperature, carbon dioxide, nitrous oxide, methane and other greenhouse gases), race of the pathogen, susceptibility of the wheat cultivar to diseases and timing of the infection.[33] The consequential damage to the wheat depends on the level of plant development at the time of the infection and the gravity of the disease.

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27 FAO: 'Cassava Diseases in Africa: A Major Threat to Food Security'; CaCESA: Strategic Programme Framework 2010–2015; Alabi OJ, Kumar PL and Naidu RA 'Cassava Mosaic Disease: A Curse to Food Security in Sub-Saharan Africa'.

28 Cressman K 'Desert Locust' at 87–105.

29 Salih AAM et al. 'Climate Change and the Locust Outbreak in East Africa'.

30 UN: 'East African Countries Better Prepared, but Desert Locust Threat "'Not Over"'.

31 Singh RP, Huerta-Espino J and Roelfs AP *The Wheat Rusts* at 35; Bhardwaj SC et al. 'Wheat Rush Research: Then and Now' at 1231–1244.

32 Tadesse W, Bishaw Z and Assefa S 'Wheat Production and Breeding in Sub-Saharan Africa: Challenges and Opportunities in the face of Climate Change'.

33 Mylonas I et al. 'Better Farming Practices to Combat Climate Change' at 10. Race in Plant Pathology refers to a pathogen's ability to cause disease on its host. See Anderson JP et al. 'Plants versus Pathogens: An Evolutionary Arms Race' at 499–512.

14.2.3 *Soil degradation*

Soils are invaluable natural resources and living ecosystems that are the foundations of agricultural production.[34] Healthy soils comprise a good mixture of soil structure, organic-matter content, chemistry, biology and water permeation, which are fundamental to the growth of nutritious plants.[35] Healthy soils are also rich in biological diversity that help to fight against diseases and pests. Notably, soils play a crucial role in mitigating climate change as they provide the second largest carbon sink (first is the ocean), which regulate atmospheric carbon dioxide and greenhouse gas effects. Soil degradation can both be natural, and human made.[36] Soil degradation occurs when the quality of soil diminishes, through the loss of certain biological, chemical, or physical qualities, resulting in its inability to support plants and animals. Soil degradation, which make agricultural lands less fertile, remain a prevalent threat to agricultural production in Africa.[37]

The primary causes of human-made soil degradation in Africa include deforestation, excessive grazing, excessive use of agrochemicals and unsustainable intensive farming practices.[38] For instance, unsustainable intensive farming can contribute to the erosion of the top layer of soils, which are typically rich in organic matter and essential nutrients.[39] Over time, the erosion leads to the depletion of fertile agricultural land, reducing its yield and sometimes even rendering it barren. Consequently, farmers usually resort to applying more agrochemical inputs, resulting in environmental problems like acidification, nutrient imbalances, and eutrophication in water bodies. Similarly, intensive farming activities such as the use of heavy machinery and ploughing can compact the soil, reducing its porosity and ability to absorb water. As compacted soils are less aerated, they restrict root growth, which leads to reduced crop yields and increased vulnerability to drought. The runoff from compacted soils can also contribute to erosion and water pollution.

The three interrelated threats examined in this part are non-exhaustive as there are innumerable threats to agricultural production in Africa. However, a recurrent theme across the three threats covered is the role of human activities and climate change. The third part analyses how AI can tackle these threats to agricultural production in Africa.

14.3 The role of artificial intelligence in tackling threats to agricultural production

AI has the potential to tackle threats to agriculture and improve productivity and efficiency at all stages of agricultural value chains.[40] AI can be employed to tackle the

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34 Wild A *Soils and the Environment*.
35 See Summer ME *Handbook of Soil Science*.
36 Mganga KZ 'Agricultural Land Degradation in Kenya' at 273–300.
37 Lal R and Stewart BA (eds) *Soil Degradation and Restoration in Africa*.
38 Ibid.
39 See generally FAO and ITPS: 'Status of the World's Soil Resources: Main Report'.
40 Young S 'The Future of Farming: Artificial Intelligence and Agriculture' at 45–47; Shaikh TA, Rasool T and Lone FR 'Towards Leveraging the Role of Machine Learning and Artificial Intelligence in Precision Agriculture and Smart Farming' at 1–29, Nguyen C et al. 'Early Detection of Wheat Yellow Rust Disease and Its Impact on Terminal Yield with Multi-Spectral UAV-Imagery' at 1–28.

threats to agricultural production examined in the preceding part. On factors relating to climate change: AI can be employed to forecast floods and droughts. It can target water and input use to limit waste and environmental pollution. In addition, AI can be utilised for harvesting, thereby limiting agricultural loss and waste. On factors relating to pests and diseases: AI can detect and treat pests and diseases with precision. On soil degradation: AI can monitor soil conditions. Before unpacking the contemporary role of AI in tackling threats to agricultural production, a brief historical trajectory of AI is elucidated next.

14.3.1 *The historical development of artificial intelligence*

The history of AI can be traced back to the 1950s and to an epochal conference organised by John McCarthy entitled 'Dartmouth Summer Research Project on Artificial Intelligence', which was held at Dartmouth College in Hanover, New Hampshire in 1956.[41] During the conference, the proof of concept for AI, called *Logic Theorist* was initialised by Allen Newell, Cliff Shaw, and Herbert Simon.[42] The Logic Theorist was programmed to mimic human ability to solve mathematical problems and proved to be more efficient than human mathematicians after beating two renowned mathematicians: Alfred North Whitehead and Bertrand Russell. The Logic Theorist significantly contributed to birth the field of AI. The term 'AI' was coined at the conference and this period was termed 'the birth of Artificial Intelligence'.[43]

Over the years, AI has undergone tremendous growth and development.[44] The years between 1956 and 1974 was known as 'the golden years – Early enthusiasm'.[45] Within this period, the first chatbot was created. Following 'the first AI winter' a period between 1974 and 1980 where interest in AI decreased, 'the boom of AI' (1980–1987) saw the development of expert systems. The 'second AI winter' came between 1987 and 1993. This was then followed by 'the emergence of intelligent agents' (1993–2011), a period where IBM Deep Blue, an AI system, beat a world chess champion.[46] This period also saw the development of an AI vacuum cleaner and the rise of AI-powered businesses such as Facebook, Twitter, and Netflix.[47] From 2011 to the present, the era of 'deep learning, big data and artificial general intelligence', has seen the application of AI in various aspects of our lives, such as augmenting workforce, better language modelling, cyber security, autonomous vehicles and, more recently, metaverse (a unified persistent digital environment).[48]

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41 Copeland J *Artificial Intelligence: A Philosophical Introduction*.

42 Newell A and Simon H 'The Logic Theory Machine – A Complex Information Processing System' at 61–76; Gugerty L 'Newell and Simon's Logic Theorist: Historical Background and Impact on Cognitive Modelling'.

43 Ibid.

44 Mc Corduck P and Cfe C *Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence*; Buchanan BG 'A (Very) Brief History of Artificial Intelligence' at 53–60; Haenlein M and Kaplan A 'A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence' at 5–14, Ekmekci PE and Arda B *Artificial Intelligence and Bioethics* at 1–15, O'Regan G *A Brief History of Computing* at 249–273; Kampakis S *Predicting the Unknown: The History and Future of Data Science and Artificial Intelligence*.

45 Taulli T *Artificial Intelligence Basics: A Non-Technical Introduction* at 1–17.

46 Ibid.

47 Ibid.

48 Ibid.

In the past six decades, there has been a massive shift in technological and engineering developments towards AI. Over these decades, AI started living up to its design as a technology that leverages on Big Data to deliver real value. However, the meaning of AI remains unclear.[49] Most people refer to AI as a machine that mimics human intelligence or a machine that thinks and acts like humans. Although this may appear to be correct, there is no generally accepted definition of AI.[50] At the same time, there are several misconceptions and anecdotes about AI. AI has been described as a methodology that works like the human brain, as a technology that describes how the human brain works, and as machines that learn by themselves. Emmert-Streib, Yli-Harja and Dehmer suggest that the preferable approach to understanding AI is to recognise that AI deals with an artificial form of intelligence.[51]

Since the definition of AI is still evolving and contentious, it is important to establish its goals. Winston and Brown note that the primary goal of AI is to make machines smarter, while its secondary goal is to make machines more useful.[52] Drawing from these goals, AI can be defined as the development of machines or algorithms that reason, learn, percept, and solve problems. AI enjoys a synergistic relationship with Big Data.[53] To be sure, AI and Big Data are closely associated. AI models train on Big Data; without AI, the insights hidden in Big Data would remain uncovered. Furthermore, AI consists of several sub-fields. One of the major sub-fields of AI is machine learning (ML) which is often misunderstood as AI rather than an application or subset of AI.[54] ML is the study of computer algorithms with the ability to learn and improve their experiences by using the data –with little or no human intervention.[55] Other sub-fields of AI include natural language processing, neural networks and computer vision. Natural language processing covers how machines analyse and process large amounts of natural language data. Neural networks are algorithms designed to recognise patterns in data. Computer vision comprise algorithms trained to replicate the system of human vision and can recognise objects and understand images.

Although AI is not infallible, it presents pioneering opportunities. For instance, AI machines or algorithms can operate effectively around the clock without breaks or interruptions. As such, they can be deployed to carry out tasks that are repetitive and time-consuming. AI facilitates simplified, speedy and smarter decision-making processes. Furthermore, AI is adaptable, which means that it can be deployed across industries including the automobile, education and finance industries through self-driving cars, robotics, voice assistants, personalised learning, automated financial assistance and fraud preventions/detection.

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49 Nilsson NJ *The Quest for Artificial Intelligence: A History of Ideas and Achievements*.

50 Ibid.

51 Emmert-Streib F, Yli-Harja O, Dehmer M 'Artificial Intelligence: A Clarification of Misconceptions, Myths and Desired Status' at 91.

52 Winston PH and Brown RH (eds) *Artificial intelligence, An MIT perspective*.

53 Duan Y, Edwards JS and Dwivedi YK 'Artificial Intelligence for Decision Making in the Era of Big Data-Evolution, Challenges and Research Agenda' at 63–71.

54 De Saint Laurent C 'In Defence of Machine Learning: Debunking the Myths of Artificial Intelligence' at 734.

55 Palanivinayagam A et al. 'An Optimized Machine Learning and Big Data Approach to Crime Detection'.

14.3.2 *How is artificial intelligence applied in the agricultural industry*?

AI plays a pivotal role in agriculture.[56] It offers technological advances that aim to proffer innovative solutions to tackle threats and challenges to agricultural production while improving agricultural activities. To be specific, AI in agriculture can cover the application of technologies to (i) monitor and address climate change impacts; (ii) monitor and control diseases and pests; and (iii) monitor and improve soil conditions, with the overarching tripartite objectives to produce healthier crops, improve yields and enhance agricultural-related tasks.

(a) Applying artificial intelligence through precision agriculture

One of the key avenues through which AI is applied in agriculture is precision agriculture. Precision agriculture is a strategy that combines a set of technologies such as information systems and management, remote sensor networks, survey drones, satellite position data and enhanced machineries to optimise agricultural production.[57] Put differently, precision agriculture produces effective and operational results that enhance the quantity and quality of agricultural produce with less input. For instance, precision agriculture can monitor crop temperature, crop moisture and soil composition. It can also determine the quantity of seeds, water, fertiliser and other inputs to apply in farming to maximise yield and minimise waste – including greenhouse gas emissions from agrochemicals. The precision agriculture process starts with data collection and analysis that leads to informed and strategic decision-making. An example of this process is the use of ML algorithms to predict the suitability of crops based on soil type.[58]

As agricultural ecosystems are rapidly expanding, entrepreneurs and businesses are increasingly interested in investing in agriculture. However, most of these new players lack traditional agricultural knowledge.[59] Traditional knowledge includes the historical and intergenerational transfer of knowledge, resources, beliefs, and practices.[60] Traditional farming knowledge has evolved over centuries and has been shaped through experiments, crisis, and mistakes.[61] Traditional agricultural knowledge is often site-specific. This means that the traditional agricultural knowledge is primarily developed, conserved and applicable to crops in a specific environment. Nevertheless, traditional knowledge can also be fluid and dynamic as it encompasses lessons that can be adapted and transplanted.[62]

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56 Liu SY 'Artificial intelligence (AI) in agriculture' at 14–15; Jha K et al. 'A Comprehensive Review on Automation in Agriculture using Artificial Intelligence' at 1–12.

57 Zhang N, Wang M and Wang N 'Precision Agriculture: A Worldwide Overview' at 113–132; Gebbers R and Adamchuk V 'Precision Agriculture and Food Security' at 828–831.

58 Chen Q et al. 'AI-Enhanced Soil Management and Smart Farming' (2022) 38 *Soil Use and Management* at 7–13.

59 Flora IP 'On Kereksuk Rice Farm, Resolute 4.0 and Agriculture in Nigeria: An Interview with Rotimi Williams (Part 1)'.

60 Okediji R 'Traditional Knowledge and the Public Domain' at 1–16; Oguamanam C 'Wandering Footlose: Traditional Knowledge and the "Public Domain" Revisited' at 306–325; Okediji R 'A Tiered Approach to Rights in Traditional Knowledge' at 271–321.

61 Berkes F and Turner NJ 'Knowledge, Learning and the Evolution of Conservation Practice for Social-Ecological System Resilience' at 479–494.

62 Kloppenburg J 'Social Theory and the De/Reconstruction of Agricultural Science: Local Knowledge for an Alternative Agriculture' at 519–548.

With limited traditional knowledge, contemporary farmers struggle to determine how to grow crops efficiently and effectively. For example, considering the nuances in soil types even within the same geographical state, farmers lacking the relevant traditional knowledge to determine suitable soil types for crop growth, can utilise precision agriculture to make informed decisions. Scientists and researchers have developed predictive analytics models that are trained on diverse soil classes and compositions to match and predict the best types of crops to grow on different soil types.[63] Accordingly, with precision agriculture, farmers with limited traditional knowledge can apply predictive analytics models to enhance their farming activities. However, not all farmers (especially small-scale farmers) can afford to adopt precision agriculture technologies due to the cost constraints.

(b) Applying artificial intelligence to diagnose crop diseases

Early, accurate diagnosis and monitoring of crop diseases offers the opportunity for prompt and targeted interventions. ML, image processing, big data and cloud computing have facilitated the development of AI driven interventions and solutions. By utilising datasets such as drones, images and satellites, AI engenders automated, accurate and rapid diagnosis and monitoring of crop diseases, which advance agriculture efficiencies. Crop disease management is crucial for ensuring food security, as diseases have adverse impacts on yields and agricultural harvests. Still, crop disease management is challenging, as the ability of farmers to detect ailing plants and initiate recovery processes require significant expertise.

AI technologies have been adopted across the globe to diagnose and treat crop diseases.[64] For example, at the early stages of the adoption of computer-aided systems in agriculture, models were developed to forecast diseases on plant leaves, based on the wetness duration of the leaves.[65] The percentage of infection in leaves were detected by a hybrid system comprising fuzzy logic and image processing. Similarly, Cameroonian based company, Agrix Tech, developed an application that enables farmers to diagnose diseases and receive suggestions on suitable treatments after 10 seconds of uploading the pictures of ailing fruits.[66] Farmers in Kenya extensively use drones to identify pests and diseases. According to Bancy Mati, Director, Water, Research and Resource Centre (Warrec) at Jomo Kenyatta University of Agriculture and Technology, 'the use of flying sensors has enabled small and medium sized farmers to identify diseases early. The

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63 Rahman SAZ, Mitra KC and Islam SMM 'Soil Classification Using Machine Learning Methods and Crop Suggestion Based on Soil Series' at 1–4.

64 Qin F et al. 'Identification of Alfafa Leaf Diseases Using Image Recognition Technology' at 1–26; Zamani AS et al. 'Performance of Machine Learning and Image Processing in Plant Leaf Disease Detection' at 1–7; Jeong S, Jeong S and Bong J 'Detection of Tomato Leaf Miner Using Deep Neural Network' at 1–11; Patil RR et al. 'An Artificial Intelligence Based Novel Rice Grade Model for Severity Estimation of Rice Diseases' at 1–19; Hamna W et al. 'A Mobile-Based System for Detecting Ginger Leaf Disorders Using Deep Learning' at 1–13, Al-Gaashani MSAM et al. 'Using a Resnet 50 with Kernel Attention Mechanism for Rice Disease Diagnosis' at 1277; Bouguettaya A et al. 'A Survey on Deep Learning-Based Identification of Plant and Crop Diseases from UAV-Based Aerial Images' at 1297–1317.

65 Sannakki S et al. 'Leaf Disease Grading by Machine Vision and Fuzzy Logic' at 1709–1716; Tilva V, Patel J and Bhatt C 'Weather Based Plant Diseases Forecasting Using Fuzzy Logic' at 1–5.

66 Agrix Tech: https://www.agrixtech.com/#home.

system is able to identify diseases at least ten times earlier than the naked human eye. It serves as an early detection system.'[67]

In addition, a multidisciplinary team including researchers from the Pennsylvania State University, FAO, International Institute of Tropical Agriculture (IITA) and International Maize and Wheat Improvement Centre (CIMMYT) among others developed an AI diagnostic tool, named Nuru, to diagnose crop diseases such as the cassava mosaic disease in Africa highlighted above.[68] Nuru is a deep learning object detection model that provides an inexpensive, simple but robust platform to undertake on-field diagnosis without access to the internet. An investigation conducted in East Africa to evaluate the effectiveness of Nuru as a diagnostic tool found that it could diagnose the symptoms of cassava diseases at a higher accuracy than agricultural extension agents and farmers. Nuru's diagnosis was 65% accurate in 2020, while agricultural extension agent's and farmers diagnostic accuracy were 40% to 58% and 18% to 31% respectively. Nuru's diagnostic accuracy was further developed (culminating in 74% to 88%) by increasing the number of leaves assessed to six leaves per plant.

(c) Applying artificial intelligence to soil (and crop) management

Soil quality assesses soil conditions and its capacity to sustain plant and animal production within an ecosystem boundary. Solid knowledge of various soil types and conditions would enhance crop production. However, not all farmers possess this knowledge. Indeed, it will be near impossible for some contemporary farmers to have comprehensive knowledge of soil types and conditions. AI, therefore, provides options to facilitate sustainable soil management. For instance, Zhao et al. developed an artificial neural network model that predicts soil textures based on certain soil attributes.[69] As a result of AI developments, automated systems have been incorporated in sensors to monitor and detect soil temperature, moisture, nitrogen status and to predict crop yields.[70] In 2021, an AI-driven platform, Crop Nutrition Laboratory Services Ltd (Cropnuts) launched an AI-based soil testing and digital crop advisory service for use around Africa, known as AgViza. Cropnuts spent five years in development and capturing thousands of calibrations of soil samples. AgViza measures soil fertility properties and delivers prime soil health management and fertiliser advice to farmers. The technology reduces the cost of soil testing by over 75%. This makes it affordable to farmers, especially small-scale farmers in the rural areas.

Building on soil management, crop management incorporates the holistic management of crops, including pre-sowing, the sowing process, growth monitoring, harvesting, crop storage and distribution. Like soils, a sound understanding of crop properties will not only increase crop yields but protect the environment. Crop-management systems have been developed to predict the suitability of crops to various soil parameters. These parameters include PH, soil type, temperature, humidity, rain, nitrogen, sulphur, phosphate, manganese, copper, calcium, iron, potassium, and depth. Dai, Huo

67 Mutembei P 'Farmers Turn to Drone to Fight Crop Diseases'.

68 Mrisho LM et al. 'Accuracy of a Smartphone-Based Object Detection Model, PlantVillage Nuru, in Identifying the Flora Symptoms of Viral Diseases of Cassava – CMD and CBSD'.

69 Zhao Z et al. 'Predict Soil Texture Distributions Using an Artificial Neural Network Model' at 36–48.

70 Chen et al. at 7–13.

and Wang propose a model that enables crops to respond to soil moisture and salinity.[71] Furthermore, Song and He recommend the implementation of models that detect crops nutrition disorder and predict crop yield.[72]

While the examples above show how AI technologies have been innovatively applied in agriculture, the adoption of AI can exacerbate challenges and disruptions to Africa's agricultural ecosystems. For instance, the adoption of AI technologies can disrupt small-scale farmers and farm workers activities, and lead to loss of jobs. Second, it can result in the influx of businesses that undertake large-scale industrial agriculture and focus on maximising profits to the detriment of farmers' livelihoods and environmental sustainability. Third, the cost of access to (and maintenance of) the AI technologies could exacerbate of the digital divide through the exclusion of some small-scale farmers from its benefits. Fourth, the adoption of AI could result in the capturing, storage and unauthorised use of Africa's robust agriculture data, opening up data privacy/data security concerns. This is especially concerning because AI developments are driven primarily by the private-sector actors who are predominantly interested in profit maximisation. Fifth, the wide-spread reliance on AI technologies could contribute to the decline and extinction of traditional agricultural knowledge in Africa.

However, the laws and policies introduced in Africa can address some of these challenges and shape the agriculture and AI trajectories in the region. With Africa's increasing push towards regional integration through the African Continental Free Trade Area (AfCFTA), AU instruments and initiatives will play a crucial role in setting the standards for national governments around Africa. For instance, year 2022 was earmarked 'The Year of Nutrition: Strengthening Resilience in Nutrition and Food Security on the African Continent'.[73] The AU's current law and policy architecture for agriculture and AI is investigated next.

14.4 The African Union's laws and policies on agriculture

Under the AU's Pan-African Agenda 2063, which sets out its collective vision for an integrated, prosperous and peaceful Africa, driven by its own citizens and representing a dynamic force in the international arena, the AU seeks to consolidate the modernisation of African agriculture and agro-businesses, through scaled up value addition and productivity.[74] It sets out the following five pertinent action goals, which span across imports, trade, technology, finance, land, inputs and gender, to achieve its objectives. The goals are (i) to completely eliminate hunger and food insecurity; (ii) to reduce the imports of food and raise intra-African trade in agriculture and food to 50% of total formal food and agricultural trade; (iii) to expand the introduction of modern agricultural systems, technology, practices and training, including the banishment of hand-hoe; (iv) to develop and implement affirmative policies and advocacy to ensure women's

71 Dai X, Huo Z and Wang H 'Simulation for Response of Crop Yield to Soil Moisture and Salinity with Artificial Neural Network' at 441–449.

72 Song H and He Y 'Crop Nutrition Diagnosis Expert System Based on Artificial Neural Networks' at 357–362; Ji B et al. 'Artificial Neural Networks for Rice Yield Prediction in Mountainous Regions' at 249–261.

73 AU: 'The Year of Nutrition'.

74 AU Agenda 2063: 'The Africa We Want'. See also Fagbayibo B 'Nkrumahism, Agenda 2063, and the Role of Intergovernmental Institutions in Fast-Tracking Continental Unity' at 629–642.

increased access to land and inputs and ensure that at least 30% of agricultural financing are accessed by women; and (v) to economically empower women and youth by enhancing access to financial resources for investment.[75]

The AU's Department of Agriculture, Rural Development, Blue Economy and Sustainable Environment (ARBE) is responsible for realising the agricultural aspirations of Agenda 2063 and promoting agricultural development and agricultural transformation in Africa.[76] Its central mandates include promoting agricultural and rural development, promoting policies and formulating strategies to enhance food security and nutrition, conducting research on climate change and supporting the harmonisation of policies and strategies among regional economic communities (RECs).[77] To deliver its vision on agriculture, the AU has adopted several initiatives to promote agricultural transformation in Africa, including: The New Partnership for Africa's Development (NEPAD), Comprehensive Africa Agriculture Development Programme (CAADP), Africa Seed and Biotechnology Programme (ASBP), Ecological Organic Agriculture Initiative (EOAI) and Partnership for Aflatoxin Control in Africa (PACA).

14.4.1 *Agricultural systems: Comprehensive Africa Agriculture Development Programme*

CAADP aims to help African countries eliminate hunger and reduce poverty by raising economic growth through agriculture-led development.[78] Under CAADP, African governments agreed to allocate at least 10% of national budgets to agriculture and rural development, and to achieve agricultural growth rates of at least 6% per annum. Underlying these investment commitments are targets to reduce poverty and malnutrition, increase productivity and farm incomes, and improve the sustainability of agricultural production and use of natural resources.[79] CAADP also supports countries to enhance resilience to climate variability through the development of disaster preparedness policies and strategies, early warning response systems and social safety nets. In 2014, AU heads of states and governments reaffirmed their commitment to CAADP through the adoption of the Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods.[80]

Under the Malabo Declaration, the heads of states and governments made seven specific interconnected commitments germane to agriculture. The commitments are (i) to recommit to the CAADP process; (ii) to enhance investment finance in agriculture; (iii) to achieve zero hunger and end hunger by 2025; (iv) to halve poverty by 2025 through inclusive agricultural growth and transformation; (v) to boost intra-African

75 Ibid.

76 AU: 'Agriculture, Rural Development, Blue Economy, and Sustainable Environment (ARBE)'.

77 Ibid.

78 AU: 'The Comprehensive African Agricultural Development Programme'.

79 Bruntrup M 'The Comprehensive Africa Agriculture Development Programme (CAADP) – An Assessment of a Pan-African Attempt to Revitalise Agriculture' at 79–106; Poulton C et al. 'The Comprehensive Africa Agriculture Development Programme (CAADP): Political Incetives, Value Added and Ways Forward'; Benin S 'Impacts of CAADP on Africa's Agricultural-Led Development' at 1–56; Makombe T, Tefera W and Ulimwengu JM 'Tracking Key CAADP Indicators and Implementation Processes' at 196–212.

80 AU Heads of States and Governments adopted the Malabo Declaration at the African Union Summit in Malabo, Equatorial Guinea in June 2014.

agricultural trade in agricultural commodities and services; (vi) to enhance resilience of livelihoods and production systems to climate variability and other shocks; and (vii) to conduct a biennial review of progress made in achieving these commitments. Similarly, in the AU's Third Biennial Review Report on CAADP, African countries renewed their commitment to enhance the implementation of CAADP commitments and priorities.[81] The Report revealed that Rwanda, Tanzania and Zimbabwe have demonstrated recommitment to the principles and values of the CAADP process. Egypt, Eswatini, Seychelles and Zambia are on course to achieve the commitment to enhance investment finance in agriculture while Kenya is on course to achieve the commitment to end hunger by 2025.

Although agriculture remains the mainstay of many African economies, the sector is vulnerable to volatility. National agriculture plans that commit to investment in sustainable agriculture, including by AI in agriculture, will help boost agricultural production. The synoptic overview of CAADP above reveals its multidimensional aims and commitments, which, if appropriately implemented, can help to reconstruct the complex social, economic, environmental and technological contexts required for agricultural development in Africa. This contextual and holistic approach is imperative because sustainable agricultural development in Africa cannot occur without addressing the continent's unique predicaments.

14.4.2 *Seed systems: Africa Seed and Biotechnology Programme*

The ASBP offers a strategic approach to the comprehensive development of seed and biotechnology sectors in Africa, considering the diverse needs of individual countries.[82] Endorsed by the AU Assembly in 2007, the ASBP is the outcome of AU discussions on the importance of improved seeds for increasing agricultural productivity in Africa.[83] It contributes to realising the aims and commitments under the CAADP as discussed above as well as realising SDGs 1, 2, 12 and 13.

The overall goal of the ASBP is to promote food security, nutrition and poverty alleviation in Africa, through the establishment of effective and efficient seed systems and enhanced application of biotechnologies within the seed sector.[84] As indispensable agricultural inputs, seeds developed in both the informal and formal sectors can contribute to increased agricultural productivity, food sovereignty and food security in Africa.[85] However, limitations of Africa's seed systems include prioritisation of the formal seed sector (over the informal seed sector), minimal attention to building resilient and sustainable seed systems, deficient extension services as well as ineffective implementation of seed policies and international agreements.

To address some of these limitations, the ASBP aims to boost national capacity for improved seed production, multiplication and distribution. It also strives to improve seed quality assurance procedures to ensure consistent production of high-quality seed

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81 AU: 'African Union Launches the 3rd Biennial Review Report as AU Member States Renew their Commitment to Accelerate the Implementation of the CAADP for a Resilient African Food System'.

82 AU: 'African Seed and Biotechnology Programme'.

83 Ibid.

84 Ibid. at 9.

85 Louwaars NP, De Pef WS and Edeme J 'Integrated Seed Sector Development in Africa: A Basis for Seed Policy and Law' at 186–214.

for farmers. Simultaneously, it seeks (i) to strengthen linkages between the formal and informal seed sectors to meet farmers' needs; (ii) to promote effective seed policies and regulations that boost seed trade among African nations; (iii) to enhance capacity for conserving and sustainably using plant genetic resources for food and agriculture; (iv) to increase capacity to use biotechnology to enhance plant breeding and high-quality seed production; (v) to increase capacity to implement biosafety measures; and (vi) to establish model codes of conduct for seed use in emergency situations. However, civil society organisations (CSO) such as the African Centre for Biosafety, Eastern and Southern Africa Farmers Forum, and Network of Farmers and Agricultural Producers Organisations of West Africa have questioned the safety and efficacy of introducing biotechnological products such as genetically modified (GM) crops in Africa.[86]

Rigorous multidisciplinary scientific research and evaluations must be undertaken to ascertain safety and benefits of biotechnological products, to respond to the CSO concerns and to fully benefit from the promises of the ASBP. If well implemented, the ASBP can contribute to addressing the food insecurity challenges confronted in Africa from the perspective of the seed sector. Similarly, if well developed, Africa's vibrant informal seed systems have the potential to enhance food security. Nonetheless, there is a cessation between the AU positions and national realities as Africa's seed systems are increasingly flooded with seeds and chemicals by foreign multinational agrichemical companies, despite the ASBP and EOAI discussed below.

14.4.3 *Agroecological (agricultural and seed) systems: Ecological Organic Agriculture Initiative*

The EOAI was introduced in 2012 in response to the increased use of agricultural inputs, especially inorganic fertilisers, pesticides and irrigation systems, which have negative impacts on soils and biological diversity.[87] The use of these agricultural inputs adversely affects crop genetic diversity, human nutrition and exacerbate climate change. As discussed during the Addis Ababa Declaration on Agroecology, Ecological Organic Agriculture and Food Sovereignty Conference that was held in November 2016, degraded soils that lack essential nutrients limit current and future agricultural production in Africa.[88] Nevertheless, driven by private national and multinational agribusinesses, large-scale intensive agriculture, which contribute to soil degradation continue proliferating because of preferential state support. Conversely, sustainable and resilient small-scale agriculture, which adopt agroecological practices that enrich soil qualities and nutritional values of food, are marginalised. The investment and intellectual property regimes around Africa often promote large-scale systems and side-line small-scale farmers' practices. Yet, small-scale farmers can sustainably increase agricultural production using agroecological practices.[89]

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86 Singh JA and Daar AS 'The 20-Year African Biotech Plan' at 272–274; Mabaya E et al. 'Factors Influencing Adoption of Genetically Modified Crops in Africa' at 577–591.

87 Biovision Africa Trust: 'Ecological Organic Agriculture Initiative'.

88 Changing Food Systems in Africa: Agroecology and Food Sovereignty and their Role in Nutrition and Health 2016 Conference Declaration 'Addis Ababa Declaration on Agroecology, Ecological Organic Agriculture and Food Sovereignty: The Way Forward for Nutrition and Health in Africa'.

89 Mousseau F 'The Untold Success Story of Agroecology in Africa' at 341–345; Pereira L, Wynberg R and Reis Y 'Agroecology: The Future of Sustainable Farming?' at 4–17;

[*continued on next page*]

Drawing from the preceding context and in reaction to the AU Council's Decision on Organic Farming passed during the Eighteenth Ordinary Session held between 24 and 28 January 2011, African governments called for initiatives to help move the continent towards sustainable and resilient agricultural production systems. These efforts culminated in the adoption of the EOAI.[90] The EOAI's vision is to achieve resilient and vibrant ecological organic agricultural systems for enhanced food and nutrition security and sustainable development in Africa. Similarly, its mission is to scale ecologically and organically sound strategies and practices through institutional capacity development, scientific innovations, market participation, public policies/programs, outreach, communication, coordination, networking and partnerships in Africa. The EOAI has four core interconnected values: to respect nature and sustainable development; to promote family farming cultures, indigenous knowledge, cultural practices and wisdom; to embrace fairness and justice to the ecosystems; and to promote safe, nutritious and healthy food.

The EOAI's vision, mission and core values embody its laudable ethos to champion the extensive adoption and maintenance of ecological organic agricultural systems in Africa, driven by small-scale farmers. A question that emerges from the EOAI provisions is: How do countries ascertain appropriate implementation mechanisms at national levels? This is pertinent because the emerging agricultural trend around Africa, as driven by external donors, or 'philanthrocapitalists', is a shift towards chemical heavy input applications with minimal recognition and reward for agroecological techniques and traditional knowledge.[91]

14.4.4 *Crop-disease control: Partnership for Aflatoxin Control in Africa*

The PACA aims to support agricultural development by protecting crops, livestock, and consumer health through catalysing, coordinating, and promoting effective aflatoxin control along agricultural value chains in Africa.[92] Aflatoxin is a toxic and carcinogenic group of fungal metabolites that contaminate food and agricultural products. Aflatoxin contaminates African staples such as cassava, maize, rice and groundnuts.[93] Launched by the African Union Commission (AUC) in 2012, the PACA Secretariat has a ten-year strategy to improve the efficiency of governments to tackle the aflatoxin challenge in Africa. It seeks to work with governments and other stakeholders through three primary activities: Continental/inter-regional convening, mainstreaming and knowledge management.

On continental/inter-regional convening, the secretariat is committed to supporting RECs to organise regional convenings that promote collaboration across countries, share new developments and best practices, and resolve specific challenges across regions. On mainstreaming, the secretariat is committed to supporting mainstreaming

[*continued from previous page*]

Nyantakyi-Frimpong H et al. 'Agroecology and Healthy Food Systems in Semi-Humid Tropical Africa: Participatory Research with Vulnerable Farming Households in Malawi' at 42–49.

90 AU: 'Why Ecological Organic Agriculture'.

91 Schurman R 'Micro (soft) Managing a "Green Revolution" for Africa: The New Donor Culture and International Agricultural Development' at 180–192; Mushita A and Thompson C 'Farmers' Seed Systems in Southern Africa: Alternatives to Philanthrocapitalism' at 391–413.

92 PACA: 'About PACA?'

93 Keller B et al. 'The Potential for Aflatoxin Predictive Risk Modelling in Sub-Saharan Africa: A Review' at 101–118.

of aflatoxin in regional frameworks including CAADP as mentioned above, to ensure aflatoxin issues are integrated and addressed within these platforms and that there is consistency and congruency between frameworks and harmonisation across countries. The secretariat also seeks to serve as a hub to identify, document, and disseminate best practices and effective technologies; and serve as a technical knowledge hub for aflatoxin-related information. Ultimately, PACA's vision is to achieve an Africa that is free from the harmful effects of aflatoxins. As mentioned above, AI can contribute to early crop-disease detection and treatment. Rapid, low-cost aflatoxin detection using AI have already been developed and introduced around Africa.

While the four instruments set out laudable provisions, core challenges to realising their goals and objectives are poor coordination, and disparity between the AU provisions and agricultural policies and practices promoted at national levels, especially triggered by external funding.

14.5 The African Union's laws and policies on artificial intelligence

Africa has the potential to leverage the opportunities presented by AI to enhance efficiency in wide-ranging industries, including agriculture.[94] Despite the opportunities that AI offers, it has inherent drawbacks.[95] Thus, suitable laws and policies are required to regulate its development. The Digital Transformation Strategy for Africa 2020–2030 (DTSA) represents a positive stride in this direction. It builds on existing AU regional integration programmes under its Agenda 2063 including the AfCFTA, Single African Air Transport Market, Free Movement of Persons and Policy/Regulatory Initiative for Digital Africa.[96] The DSTA seeks to promote an integrated and inclusive digital society and economy in Africa that improves the quality of life of Africa's citizens, strengthens existing economic sectors, facilitates their diversification and development, and empowers Africans to be creators of innovative products and not solely consumers in the global economy. Its overarching objective is to harness digital technologies and innovation to reshape African societies and economies. It aims to advance Africa's integration, spur inclusive economic growth, stimulate job creation, and bridge the digital divide on the continent. Additionally, the DSTA promotes ownership of contemporary digital management tools, inclusive digital skills and human capacity to lead digital transformation in Africa through, among other things, coding, programming, block chain, ML, robotics and AI.

The DSTA is guided by pertinent principles that address some of the drawbacks of AI. For example, it provides that the strategy and digital transformation in Africa should be inclusive, home-grown, and safe. An inclusive digital transformation in Africa is affordable, accessible, and ubiquitous. A home-grown digital transformation is controlled and owned by African institutions and generates solutions that respond to African realities. With a safe digital transformation, stakeholders are fully informed about the benefits and drawbacks of the digital technologies. A safe digital transformation guarantees healthy disruptions to markets and businesses. The DSTA also

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94 Effoduh JO '7 Ways that African States are Legitimizing Artificial Intelligence'.

95 Gwagwa A et al. 'Artificial Intelligence (AI) Deployments in Africa: Benefits, Challenges and Policy Dimensions' at 1–28; Ade-Ibijola A and Okonkwo C 'Artificial Intelligence in Africa: Emerging Challenges' at 101–117.

96 AU: The Digital Transformation Strategy for Africa (2020–2030).

delineates key recommendations and action plans to promote the construction of relevant policy and regulation, digital innovation, digital infrastructures, and digital skills in crucial sectors, including agriculture. On agriculture, the DSTA sets out three key policy recommendations and proposed actions, namely create conducive environments to foster the development of digital agriculture, provide farmers with reliable marketing information that helps them reach their markets more effectively at lower costs, and promote the deployment of digital solutions in agriculture.

In addition to the AU initiatives, there is a nascent growth of AI laws and strategies at national levels in Africa.[97] For example, Tunisia and Senegal have laws that regulate AI start-ups. Kenya and South Africa have laws that provide for the use of technology and personal data. Botswana, Egypt, Mauritius, Tunisia and Zambia have national AI Strategies. Similarly, Egypt, Kenya, Mauritius, Nigeria, South Africa, Tunisia and Uganda have national AI agencies, task forces and commissions. As African countries continue to evolve and diversify, it is increasingly evident that AI is becoming a key strategic priority for several of these countries.[98]

14.6 Conclusion: The future of agriculture in Africa: Cautiously promoting the radical potential of artificial intelligence

Post-colonial Africa is struggling to supply enough food to meet demands of its growing population. While sustainable agricultural production in Africa was disrupted during colonisation and is still in the process of recovery, neo-colonial attempts to recapture agriculture are on the rise. However, the AU's Pan-African inspired Agenda 2063 places African interests at the centre of future inclusive and sustainable development in the region. The AU has several overlapping agricultural laws and policies on wide-ranging issues from trade, biotechnology, agroecology to crop diseases. The AU also has a digital transformation strategy that covers a variety of industries, including agriculture.

While AI has the potential to radically transform Africa's agricultural productivity and promote social and economic development, these aspirations can only be achieved through the introduction of technologies and legal regimes that are tailored to African realities. To start with, the AU should adopt a joined-up approach that reconciles its different agricultural laws and policies. For example, drawing from the initiatives discussed, the AU should clarify how African countries can balance small-scale and large-scale agriculture as well as formal and informal seed systems, while avoiding adverse effects of intensive agriculture on soils and the environment, conserving traditional agricultural knowledge, utilising agroecological technologies and controlling crop diseases. Once the AU has a firm view on how to design balanced agricultural systems, it can formulate a common position to guide African countries on the application of AI in agriculture.

The AI solutions must resolve the challenges that Africa confronts based on the AU's common position on agriculture. In other words, before introducing AI for agriculture in African countries, questions to ask could include: What are the agricultural challenges in the country? How can we design AI technologies that align with the AU's visions for agriculture and AI in response to the challenges? For example, the AI technologies

97 See Effoduh.

98 Ibid.

should not exacerbate climate change or lead to the decline of agrobiodiversity. This way, the AI introduced will contribute to the realisation of the AU's long-term transformation agenda for Africa. Nonetheless, the adoption of AI in agriculture raises some further concerns, including lack of suitable and supportive infrastructures and knowledge gaps as well as concerns about quality data, data access, digital divide and intellectual property rights (IPRs).

14.6.1 *Lack of suitable and supportive infrastructures*

In Africa, the adoption and implementation of AI technologies is often undermined by a lack of basic digital infrastructures. Two of the most important infrastructures needed for AI adoption, are connectivity and energy.[99] As AI development progresses, interconnection needs to keep pace. Unfortunately, network connections in Africa are still epileptic; the broadband coverage in the continent is one of the lowest.[100] The drawback of this lack of connectivity is that African farmers are often unable to make direct connections to data sources and IT systems spread across public data repositories and clouds.

14.6.2 *Technical knowledge and skill gaps*

Another challenge of AI in Africa is limited technical knowledge.[101] This is a serious threat to technological growth in Africa because it prevents the continent from fully adopting and leveraging the maximum potential of AI's transformative technologies. African governments must invest in improving the quality of their educational systems. This could be by providing funding for the development of digital ecosystems, research, training and start-ups. Education is key to national development.[102] Investment in and promotion of education is important, particularly subjects in Science, Technology, Engineering and Mathematics (STEM) as well as other AI-related fields. To address this, some African governments collaborate with multinational corporations to deliver AI-related degrees. For example, Google and Facebook have collaborated to deliver postgraduate studies in ML at the African Institute of Mathematical Sciences (AIMS) in Rwanda. Similarly, Google established an AI lab in Ghana to support developers with tools to enhance research and deliver technological solutions to AI-related problems. Additional initiatives must be introduced to facilitate training and development for farmers because agricultural-based AI technologies in Africa will primarily be used by farmers. Accordingly, it is essential that these farmers are trained in the use of technology in general along with AI-based technologies.

14.6.3 *Quality data, data access and digital divide concerns*

As earlier mentioned, AI and big data enjoy a synergistic relationship.[103] AI technologies deliver more efficient outcomes when granted broader access to extensive

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99 Ponnan S et al. 'An Artificial Intelligence-based Quorum System for the Improvement of the Lifespan of Sensor Networks' at 17373–17385.

100 Kiemde SMA and Kora AD 'The Challenges Facing the Development of AI in Africa' at 1–6.

101 CIPIT: 'The State of AI in Africa Report 2023' at 1–25.

102 Ugochukwu-Ibe IM and Ibeke E 'E-Learning and COVID-19. The Nigerian Experience: Challenges of Teaching Technical Courses in Tertiary Institutions'.

103 O'Leary DE 'Artificial Intelligence and Big Data' at 96–99; Obschonka M and Audretsch DB 'Artificial Intelligence and Big Data in Entrepreneurship: A New Era has Begun' at 529–539.

datasets. Despite the substantial daily generation of agricultural data, access to such data remains limited in Africa. Barriers to access include the lack of technologies to capture the data and limited infrastructure to store them. While the increase in the development of AI systems in Africa must be recognised, most of the systems are trained on data generated outside Africa, which could lead to biases. As AI depends on data to be trained, a central step towards the enhancement of AI technologies in Africa will be the expansion of its data ecosystem. Governments need to invest in infrastructures for accurate data collection, storage, and accessibility. They should also implement laws and policies that enable both private and public sectors to do the same. For example, governments can establish research institutions and provide funds for scientific research. This will widen the sources of quality data available to stakeholders.

Governments must also establish regulatory frameworks for data privacy and security via investment in cyber security. The regulatory framework must control the AI technologies to avoid the development of 'bad' AI systems. The Republic of Korea invests 5% of its GDP in emerging technologies; Africa can learn from this.[104] To control the biases, government policies must encourage 'made in Africa' AI solutions, that is to say AI systems developed in Africa, by Africans and for Africa as promoted under DTSA. In certain circumstances, stakeholders from Africa such as researchers and farmers are constrained from access to data generated from their countries due to contract rules. For example, while digital sequence information (DSI) of plants may be extracted from Africa, multinational corporations may have exclusive rights and monopolies over the information.[105] Multilateral debates on the protection of DSI are on-going among contracting parties to the Convention on Biological Diversity (CBD), International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the UN Convention on the Law of the Sea.[106]

14.6.4 *Intellectual property rights queries*

Many multinational agribusinesses incorporate AI in their operations and subsequently profit from the data generated.[107] For example, DuPont Pioneer's Field360 and WinField R7 programs identify hybrid-seed selection, provide crop-management prognoses and crop-progress predictions as foundations to recommend planting methods.[108] Pioneer's Field360 Select Software combines historical and contemporary field data with current agronomic and weather information to influence farmers' management decisions. Similarly, John Deere fixes sensors to its farming equipment, analyses the data collected from them and sells suggestions to farmers.[109] IPRs and related ethical questions that arise from the above include: Who owns the data generated from farms? Who has control over the data? Who can commercialise the data? Should consent have

104 Kiemde and Kora at 1–6.

105 Adebola T and Manzella D 'Access and Benefit Sharing and Digital Sequence Information in Africa: A Critical Analysis of Contemporary Concerns in Regional Governance' at 154–174.

106 Ibid. See also Convention on Biological Diversity 'Digital Sequence Information on Genetic Resources'; International Treaty on Plant Genetic Resources for Food and Agriculture 'Submissions on Digital Sequence Information (DSI)'.

107 Cook P and O'Neill F 'Artificial Intelligence in Agribusiness is Growing in Emerging Markets' at 1–8.

108 DuPont Pioneer: 'Pioneer Field360 Tools App for Crop Management Decisions'.

109 Mateescu A and Elish MC 'AI in Context: The Labour of Integrating New Technologies' at 25; Gervais D 'Is Intellectual Property Law Ready for Artificial Intelligence?' at 117–118.

been sought before data collection? Should compensation (monetary and non-monetary) be returned for the use of the data?

IPRs and access- and benefit-sharing laws were originally designed to protect human creativity and innovation.[110] However, the expansion of AI generated creativity and innovation raises questions about the applicability of IPRs.[111] One central question here is: Can existing IPR instruments cater to AI developed innovation and creativity? AI triggers conceptual questions about IPRs including its scope, subjects and standards. There are on-going discussions about these intersectional AI and IPRs issues at international level. For example, the premier intellectual property organisation, the World Intellectual Property Organisation (WIPO), provides a multi-stakeholder forum to promote the understanding of the IPRs issues involved in AI.[112] WIPO also hosts conversation sessions on IP and AI that assembles its members and stakeholders to discuss the impact of AI on IP.[113] The robust proceedings and papers from the conversations on IP and AI are freely accessible from the WIPO website.[114] While awaiting legal and policy clarity, contractual agreements and judicial decisions at national levels could provide tentative directions.

14.7 References

Adebola T 'Intellectual Property Rights' in De Feyter K, Turkelli GE and De Moerloose S (eds) *Encyclopedia of Law and Development*.

Adebola T and Manzella D 'Access and Benefit Sharing and Digital Sequence Information in Africa: A Critical Analysis of Contemporary Concerns in Regional Governance' in Lawson C, Rourke M and Humphries F (eds) *Access and Benefit Sharing of Genetic Resources, Information and Traditional Knowledge*.

Ade-Ibijola A and Okonkwo C 'Artificial Intelligence in Africa: Emerging Challenges' (2023) *Responsible AI in Africa: Challenges and Opportunities* 101–117.

AfDB: 'Feed Africa: A Strategy for Agricultural Transformation in Africa 2016–2025' (May 2016) <https://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Feed_Africa-_Strategy_for_Agricultural_Transformation_in_Africa_2016-2025.pdf>.

Alabi OJ, Kumar PL and Naidu RA 'Cassava Mosaic Disease: A Curse to Food Security in Sub-Saharan Africa' *APSnet features* (2011).

Alemaw BF and Matondo JI 'Overview of Climate Variability and Change in Africa: Perspectives and Experiences' in Matondo JI, Alemaw BF and Sandwidi WJP (eds) *Climate Variability and Change in Africa: Perspectives, Experiences and Sustainability* (Springer, 2020).

Ampaire EL, Acosta M, Huyer S, Kigonya R, Muchunguzi P et al. 'Gender in Climate Change, Agriculture, and Natural Resource Policies: Insights from East Africa' 158 (2020) 43–60.

110 Sherman B and Bentley L *The Making of Modern Intellectual Property Law: The British Experience 1760–1911*; Adebola T 'Intellectual Property Rights').

111 See Lee J-A, Hilty R and Liu K-C (eds) *Artificial Intelligence and Intellectual Property*.

112 World intellectual Property and Intellectual Property Policy: 'Artificial Intelligence and Intellectual Property Policy'.

113 WIPO: 'AI and IP Policy: The WIPO Conversation'.

114 Ibid.

Anderson JP, Gleason JA, Foley RC, Thrall PH, Burdon JB and Singh KB ‘Plants versus Pathogens: An Evolutionary Arms Race’ (2010) 37 *Functional Plant Biology* 499–512.

Arewa OB *Disrupting Africa: Technology, Law, and Development* (Cambridge University Press, 2021).

Arora R and Sandhu S (eds) *Breeding Insect Resistant Crops for Sustainable Agriculture* (Springer, 2017).

AU: ‘African Seed and Biotechnology Programme’ <https://www.africa-seeds.org/wp-content/uploads/2016/11/ASBP-Document.pdf>.

AU: ‘African Union Launches the 3rd Biennial Review Report as AU Member States Renew their Commitment to Accelerate the Implementation of the CAADP for a Resilient African Food System’ <https://au.int/en/pressreleases/20220314/african-union-launches-3rd-biennial-review-report-au-member-states-renew>.

AU: ‘Agriculture, Rural Development, Blue Economy, and Sustainable Environment (ARBE)’ <https://au.int/en/arbe>.

AU: ‘The Comprehensive African Agricultural Development Programme’ (22 February 2021) <https://au.int/en/articles/comprehensive-african-agricultural-development-programme>.

AU: The Digital Transformation Strategy for Africa (2020–2030) (18 May 2020).

AU: ‘Linking Agenda 2063 and the SDGs’ <https://au.int/agenda2063/sdgs>.

AU: ‘Why Ecological Organic Agriculture’ <https://eoai-africa.org/why-ecological-organic-agriculture/>.

AU: ‘The Year of Nutrition’ <https://au.int/en/theme/2022/year-nutrition>.

AU Agenda 2063: ‘The Africa We Want’ (September 2015) <https://au.int/sites/default/files/documents/36204-doc-agenda2063_popular_version_en.pdf>.

Awange J *Food Insecurity and Hydroclimate in Greater Horn of Africa: Potential for Agriculture Amidst Extremes* (Springer, 2022).

Benin S ‘Impacts of CAADP on Africa’s Agricultural-Led Development’ (2016) International Food Policy Research Institute (IFPRI Discussion Paper 01553) 1–56.

Berkes F and Turner NJ ‘Knowledge, Learning and the Evolution of Conservation Practice for Social-Ecological System Resilience’ (2006) 34(4) *Human Ecology* 479–494.

Bhardwaj SC, Prasad P, Gangwar OP, Khan H and Kumar S ‘Wheat Rush Research: Then and Now’ (2016) 86(10) *Indian Journal of Agricultural Sciences* 1231–1244.

Biovision Africa Trust: ‘Ecological Organic Agriculture Initiative’ <https://biovisionafricatrust.org/eoa-initiative/>.

Bjornlund V, Bjornlund H and Van Rooyen AF ‘Why Agricultural Production in Sub-Saharan Africa Remains Low Compared to the Rest of the World: A Historical Perspective’ 36 (2020) *International Journal of Water Resources Development* S20–S53.

Bouguettaya A, Zarzour H, Kechida A and Taberkit AM ‘A Survey on Deep Learning-Based Identification of Plant and Crop Diseases from UAV-Based Aerial Images’ (2023) 26 *Cluster Computing* 1297–1317.

Bruntrup M ‘The Comprehensive Africa Agriculture Development Programme (CAADP) – An Assessment of a Pan-African Attempt to Revitalise Agriculture’ (2011) 50 *Quarterly Journal of International Agriculture* 79–106.

Buchanan BG ‘A (Very) Brief History of Artificial Intelligence’ (2005) 26(4) *AI Magazine* 53–60.

CaCESA: Strategic Programme Framework 2010–2015.

Ceballos H, Okogbenin E, Perez JC, Lopez-Valle LAB and Debouck D ‘Cassava’ in Bradshaw JE (ed.) *Root and Tuber Crops* (Springer, 2010).

Changing Food Systems in Africa: Agroecology and Food Sovereignty and their Role in Nutrition and Health 2016 Conference Declaration ‘Addis Ababa Declaration on Agroecology, Ecological Organic Agriculture and Food Sovereignty: The Way Forward for Nutrition and Health in Africa’ <https://kipschool.org/usr_files/generic_pdf/AddisAbabaDeclaration-ENG.pdf>.

Chen Q, Li L, Chong C and Wang X ‘AI-Enhanced Soil Management and Smart Farming’ (2022) 38 *Soil Use and Management* 7–13.

CIPIT: ‘The State of AI in Africa Report 2023’ Strathmore University 1–25 <https://cipit.strathmore.edu/wp-content/uploads/2023/05/The-State-of-AI-in-Africa-Report-2023-min.pdf>.

Cook P and O’Neill F ‘Artificial Intelligence in Agribusiness is Growing in Emerging Markets’ 2020 (Note 82) International Finance Corporation, A Member of the World Bank Group 1–8.

Copeland J *Artificial Intelligence: A Philosophical Introduction* (John Wiley & Sons, 1993).

Cressman K ‘Desert Locust’ (2016) *Biological and Environmental Hazards, Risks and Disasters* 87–105.

Dai X, Huo Z and Wang H ‘Simulation for Response of Crop Yield to Soil Moisture and Salinity with Artificial Neural Network’ (2011) 121(3) *Field Crops Research* 441–449.

De Feyter K, Turkelli GE and De Moerloose S (eds) *Encyclopedia of Law and Development* (Elgar Publishing, 2021).

De Saint Laurent C ‘In Defence of Machine Learning: Debunking the Myths of Artificial Intelligence’ (2018) 14(4) *Europe’s Journal of Psychology* 734.

Duan Y, Edwards JS and Dwivedi YK ‘Artificial Intelligence for Decision Making in the Era of Big Data-Evolution, Challenges and Research Agenda’ (2019) 48 *International Journal of Information Management* 63–71.

DuPont Pioneer: ‘Pioneer Field360 Tools App for Crop Management Decisions’ (11 March 2022) <https://www.pioneer.com/CMRoot/Pioneer/Canada_en/Programs_Services/mobile/Pioneer_Field360_Tools_App.pdf>.

Effoduh JO ‘7 Ways that African States are Legitimizing Artificial Intelligence’ Open African Innovation Research (20 October 2020) <https://openair.africa/7-ways-that-african-states-are-legitimizing-artificial-intelligence/>.

Ekmekci PE and Arda B *Artificial Intelligence and Bioethics* (Springer, 2020).

Emmert-Streib F, Yli-Harja O, Dehmer M ‘Artificial Intelligence: A Clarification of Misconceptions, Myths and Desired Status’ (2020) 3 *Frontiers in Artificial Intelligence* 91.

Epule TE, Chehbouni A, Ongoma V, Brouziyne Y, Etongo D and Molua EL ‘A New Index on Agricultural Land Greenhouse Gas Emissions in Africa’ (2022) 194(9) *Environmental Monitoring and Assessment* 598–613.

Ezirigwe J, Ojike C, Amechi E and Adewopo A ‘COVID-19/Food Insecurity Syndemic: Navigating the Realities of Food Security Imperatives of Sustainable Development Goals in Africa’ (2021) 14(1) *Law and Development Review* 129–162.

Fagbayibo B 'Nkrumahism, Agenda 2063, and the Role of Intergovernmental Institutions in Fast-Tracking Continental Unity' (2017) 53(4) *Journal of Asian and African Studies* 629–642.

FAO: 'Cassava Diseases in Africa: A Major Threat to Food Security'.

FAO and ITPS: 'Status of the World's Soil Resources: Main Report' (2015).

FAO, IFAD, UNICEF, WFP and WHO: 'The State of Food Security and Nutrition in the World 2022: Repurposing Food and Agricultural Policies to make Healthy Diets more Affordable' (2022) Rome FAO <https://www.fao.org/3/cc0639en/cc0639en.pdf>.

FAO, UNECA and AUC: 'Africa – Regional Overview of Food Security and Nutrition: Statistics and Trends' (Accra: FAO, 2021).

Flora IP 'On Kereksuk Rice Farm, Resolute 4.0 and Agriculture in Nigeria: An Interview with Rotimi Williams (Part 1)' <https://www.floraip.com/2020/09/26/on-kereksuk-rice-farm-resolute-4-0-and-agriculture-in-nigeria-an-interview-with-rotimi-williams/>.

Fonjong LN and Gyapong AY 'Plantations, Women and Food Security in Africa: Interrogating the Investment Pathway towards Zero Hunger in Cameroon and Ghana' World Development (2021).

Gebbers R and Adamchuk V 'Precision Agriculture and Food Security' (2010) 327, 5967 *Science* 828–831.

Gebre GG and Rahut DB 'Prevalence of Household Food Insecurity in East Africa: Linking Food Access with Climate Vulnerability' (2021) 33 *Climate Risk Management* 1–15.

Gervais D 'Is Intellectual Property Law Ready for Artificial Intelligence?' (2020) 69(2) *GRUR International* 117–118.

GNAFC and FSIN: '2022 Global Report on Food Crises: Joint Analysis for Better Decisions' (2022).

Graham S, Ihli H J and Gassner A 'Agroforestry, Indigenous Tree Cover and Biodiversity Conservation: A Case Study of Mount Elgon in Uganda' (2022) 34 *The European Journal of Development Research* 1893–1911.

Gugerty L 'Newell and Simon's Logic Theorist: Historical Background and Impact on Cognitive Modelling' Proceedings of the Human Factors and Ergonomics Society Annual Meeting 50 (Sage Publications, 2006).

Gwagwa A, Kraemer-Mbula E, Rizk N, Rutenburg I and De Beer J 'Artificial Intelligence (AI) Deployments in Africa: Benefits, Challenges and Policy Dimensions' (2020) 26 *African Journal of Information and Communication* 1–28.

Haenlein M and Kaplan A 'A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence' (2019) 61(4) *California Management Review* 5–14.

Hamna W, Waseem A, Islam S, Hadi A, Boudjadar J and Zafar N 'A Mobile-Based System for Detecting Ginger Leaf Disorders Using Deep Learning' *Future Internet* at 1–13, Al-Gaashani MSAM, Samee NA, Alnashwan R, Khayyat M and Muthanna MSA 'Using a Resnet 50 with Kernel Attention Mechanism for Rice Disease Diagnosis' (2023) 13 *Life* 1277.

Inikori J 'The Development of Commercial Agriculture in Pre-Colonial West Africa' *African Economic History Working Paper Series* 9 (2013).

IPCC: 'Climate Change 2021: The Physical Science Basis' Working Group I contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, 2021).

IPPC Secretariat: 'Scientific Review of the Impact of Climate Change on Plant Pests: A Global Challenge to Prevent and Mitigate Plant-Pest Risks in Agriculture, Forestry and Ecosystems' (2021) FAO on behalf of the IPPC Secretariat, FAO 'Climate Change Fans Spread of Pests and Threatens Plants and Crops, New FAO Study' (2021) FAO Rome <https://www.fao.org/news/story/en/item/1402920/icode/>.

Iyiola-Tunji AO, Adamu JI, John PA and Muniru I 'Dual Pathway Model of Responses Between Climate Change and Livestock Production' in Oguge N, Ayal D, Adeleke L and Da Silva I (eds) *African Handbook of Climate Change Adaptation*

Jeong S, Jeong S and Bong J 'Detection of Tomato Leaf Miner Using Deep Neural Network' (2022) *Sensors* 1–11.

Jha K, Doshi A, Patel P and Shah M 'A Comprehensive Review on Automation in Agriculture using Artificial Intelligence' (2019) 2 *Artificial Intelligence in Agriculture* 1–12.

Ji B, Sun Y, Yang S and Wan J 'Artificial Neural Networks for Rice Yield Prediction in Mountainous Regions' (2007) 145 *Journal of Agricultural Science* 249–261.

Kampakis S *Predicting the Unknown: The History and Future of Data Science and Artificial Intelligence* (Apress, 2023).

Keller B, Russo T, Rembold F, Chauhan Y, Battilani P, Wenndt A and Connett M 'The Potential for Aflatoxin Predictive Risk Modelling in Sub-Saharan Africa: A Review' (2022) 15(2) *World Mycotoxin Journal* 101–118.

Kiemde SMA and Kora AD 'The Challenges Facing the Development of AI in Africa' (2020) IEEE International Conference on Advent Trends in Multidisciplinary Research and Innovation (ICATMRI).

Kloppenburg J 'Social Theory and the De/Reconstruction of Agricultural Science: Local Knowledge for an Alternative Agriculture' (1991) 56(4) *Rural Sociology* 519–548.

L and Da Silva I (eds) *African Handbook of Climate Change Adaptation* (Springer, 2021).

Lal R and Stewart BA (eds) *Soil Degradation and Restoration in Africa* (Routledge, 2019).

Lawson C, Rourke M and Humphries F (eds) *Access and Benefit Sharing of Genetic Resources, Information and Traditional Knowledge* (Routledge, 2022).

Lee J-A, Hilty R and Liu K-C (eds) *Artificial Intelligence and Intellectual Property* (Oxford University Press, 2021).

Liu SY 'Artificial intelligence (AI) in agriculture' (2020) 22(3) *IT Professional* 14–15.

Louwaars NP, De Pef WS and Edeme J 'Integrated Seed Sector Development in Africa: A Basis for Seed Policy and Law' (2013) 27(2) *Journal of Crop Improvement* 186–214.

Lyam PT, Duque-Lazo J, Durka W, Hauenschild F, Schnitzer J, Michalak I, Ogundipe OT and Muellner-Riehl AN 'Genetic Diversity and Distribution of Senegalia senegal (L.) Britton under Climate Change Scenarios in West Africa' 13(4) (2018) *PLoS ONE* 1–20.

Mabaya E, Fulton F, Simiyu-Wafukho S and Nang'ayo F 'Factors Influencing Adoption of Genetically Modified Crops in Africa' (2015) 32(5) *Development Southern Africa* 577–591.

Makombe T, Tefera W and Ulimwengu JM 'Tracking Key CAADP Indicators and Implementation Processes' in Quisumbing AR, Meinzen-Dick RS and Njuki J (eds) *Gender Equality in Rural Africa: From Commitments to Outcomes*.

Mateescu A and Elish MC 'AI in Context: The Labour of Integrating New Technologies' (2019) *Data & Society* 25.

Matondo JI, Alemaw BF and Sandwidi WJP (eds) *Climate Variability and Change in Africa: Perspectives, Experiences and Sustainability* (Springer, 2020).

Mc Corduck P and Cfe C *Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence* (CRC Press, 2004).

Mganga KZ 'Agricultural Land Degradation in Kenya' in Pereira P, Munoz-Rojas M, Bogunovic I and Zhao E (eds) *Impact of Agriculture on Soil Degradation: Perspectives from Africa, Asia, America and Oceania*.

Mousseau F 'The Untold Success Story of Agroecology in Africa' (2015) 58 2–3 *Development* 341–345.

Mrisho LM, Mbilinyi NA, Ndalahwa M, Ramcharan AM, Kehs AK, McCloskey PC, Murithi H, Hughes DP and Legg JP 'Accuracy of a Smartphone-Based Object Detection Model, PlantVillage Nuru, in Identifying the Flora Symptoms of Viral Diseases of Cassava – CMD and CBSD' (2020) *Frontiers in Plant Science* (1964).

Mushita A and Thompson C 'Farmers' Seed Systems in Southern Africa: Alternatives to Philanthrocapitalism' (2019) 8(3) *Journal of Political Economy* 391–413.

Mushtaq F, Ghosh A, Jalal R, Gauny J, Barelli D, Merzouk Q, Moloinyane S and Henry M *A Rapid Geospatial Analysis of the Impact of Tropical Storm Ana in Madagascar, Malawi, Mozambique, Zambia and Zimbabwe* (FAO, 2022).

Mutasa C 'Revisiting the Impacts of Tropical Cyclone Idai in Southern Africa' (2022) *Climate Impacts on Extreme Weather* 175–189.

Mutembei P 'Farmers Turn to Drone to Fight Crop Diseases' *The Standard* (2019) <https://www.standardmedia.co.ke/business/news/article/2001317191/farmers-turn-to-drone-to-fight-crop-diseases>.

Mylonas I, Stavrakoudis D, Katsantonis D and Korpetis E 'Better Farming Practices to Combat Climate Change' in Ozturk M and Gul A (eds) *Climate Change and Food Security with Emphasis on Wheat*.

Newell A and Simon H 'The Logic Theory Machine – A Complex Information Processing System' 2, 3 (1956) *IRE Transactions on Information Theory* 61–76.

Nguyen C, Sagan V, Skobalski J and Severo JI 'Early Detection of Wheat Yellow Rust Disease and Its Impact on Terminal Yield with Multi-Spectral UAV-Imagery' (2023) 15 *Remote Sensing* 1–28.

Nhamo G and Chikodzi D *Cyclones in Southern Africa Volume 3: Implications for Sustainable Development Goals* (Springer, 2021).

Nilsson NJ *The Quest for Artificial Intelligence: A History of Ideas and Achievements* (Cambridge University Press, 2010).

Ntiamoah EB, Appiah-Otoo I, Li D, Twumasi MA, Yeboah EN and Chandio AA 'Estimating and Mitigating Greenhouse Gas Emissions from Agriculture in West Africa: Does Threshold Matter?' (2023) *Environment, Development and Sustainability* 1–29.

Nyantakyi-Frimpong H, Kangmennaang J, Kerr RB, Luginaah I, Dakishoni L, Lupafya E, Shumba L and Katundu M 'Agroecology and Healthy Food Systems in Semi-Humid Tropical Africa: Participatory Research with Vulnerable Farming Households in Malawi' (2017) 175 *Acta Tropica* 42–49.

O'Leary DE 'Artificial Intelligence and Big Data' (2013) 28(2) *IEEE Intelligent Systems* 96–99.

O'Regan G *A Brief History of Computing* (Springer, 2021).

Obschonka M and Audretsch DB 'Artificial Intelligence and Big Data in Entrepreneurship: A New Era has Begun' (2020) 55 *Small Business Economics* 529–539.

Oerke EC 'Crop Losses to Pests' (2006) 144 *Journal of Agricultural Science* 31–43.

Oguamanam C 'Wandering Footlose: Traditional Knowledge and the "Public Domain" Revisited' (2018) 21 5–6 *The Journal of World Intellectual Property* 306–325.

Okediji R 'A Tiered Approach to Rights in Traditional Knowledge' (2019) 58 *Washburn Law Journal* 271–321.

Okediji R 'Traditional Knowledge and the Public Domain' Centre for International Governance Innovation Papers (No. 176) 1–16.

Ozturk M and Gul A (eds) *Climate Change and Food Security with Emphasis on Wheat* (Academic Press, 2020).

PACA: 'About PACA?' (28 March 2022) <https://www.aflatoxinpartnership.org/>.

Palanivinayagam A, Gopal SS, Bhattacharya S, Anumbe N, Ibeke E, Biamba C 'An Optimized Machine Learning and Big Data Approach to Crime Detection' 13 (2021) *Wireless Communications and Mobile Computing*.

Patil RR, Kumar S, Chiwhane S, Rani R and Pippal JK 'An Artificial Intelligence Based Novel Rice Grade Model for Severity Estimation of Rice Diseases' (2023) 13 47 *Agriculture* 1–19.

Pereira L, Wynberg R and Reis Y 'Agroecology: The Future of Sustainable Farming?' (2018) 60(4) *Environment: Science and Policy for Sustainable Development* 4–17.

Pereira P, Munoz-Rojas M, Bogunovic I and Zhao E (eds) *Impact of Agriculture on Soil Degradation: Perspectives from Africa, Asia, America and Oceania* (Springer, 2023).

Ponnan S, Saravanan AK, Iwendi C, Ibeke E and Srivastava G 'An Artificial Intelligence-based Quorum System for the Improvement of the Lifespan of Sensor Networks' (2021) 21 (15) *IEEE Sensors Journal* 17373–17385.

Poulton C, Berhanu K, Chinsinga B, Cooksey B, Golooba-Mutebi F and Loada A 'The Comprehensive Africa Agriculture Development Programme (CAADP): Political Incentives, Value Added and Ways Forward' (2014) Future Agricultures (Working Paper 077).

Qin F, Liu D, Sun B, Ruan L, Ma Z and Wang H 'Identification of Alfafa Leaf Diseases Using Image Recognition Technology' (2016) 11 (12) *PLoS ONE* 1–26.

Quisumbing AR, Meinzen-Dick RS and Njuki J (eds) *Gender Equality in Rural Africa: From Commitments to Outcomes* (2019) Resakss Annual Trends and Outlook Report.

Rahman SAZ, Mitra KC and Islam SMM 'Soil Classification Using Machine Learning Methods and Crop Suggestion Based on Soil Series' (2018) 21st International Conference of Computer and Information Technology (ICCIT).

Salih AAM, Baraibar M, Mwangi KK and Artan G 'Climate Change and the Locust Outbreak in East Africa' (ICPAC: Nairobi Kenya, 30 June 2020).

Sannakki S, Rajpurohit V, Nargund VB, Kumar A and Yallur P 'Leaf Disease Grading by Machine Vision and Fuzzy Logic' (2011) 2(5) *International Journal of Computer Applications in Technology* 1709–1716.

Schurman R 'Micro (soft) Managing a "Green Revolution" for Africa: The New Donor Culture and International Agricultural Development' (2018) 112 *World Development* 180–192.

Seife TK 'The Impact of Climate Change on Agriculture and Food Security in the Greater Horn of Africa' (2021) 48(1) *Politikon* 98–114.

Shaikh TA, Rasool T and Lone FR 'Towards Leveraging the Role of Machine Learning and Artificial Intelligence in Precision Agriculture and Smart Farming' (2022) 198 *Computers and Electronics in Agriculture* 1–29.

Sharma S, Kooner R and Arora R 'Insect Pests and Crop Losses' in Arora R and Sandhu S (eds) *Breeding Insect Resistant Crops for Sustainable Agriculture*.

Sherman B and Bentley L *The Making of Modern Intellectual Property Law: The British Experience 1760–1911* (Cambridge University Press, 1999).

Singh JA and Daar AS 'The 20-Year African Biotech Plan' (2008) 26 *Nature Biotechnology* 272–274.

Singh RP, Huerta-Espino J and Roelfs AP 'The Wheat Rusts' (2002) 2 (25) *Growth* 35.

Song H and He Y 'Crop Nutrition Diagnosis Expert System Based on Artificial Neural Networks' (2005) 1 Third International Conference on Information Technology and Applications (ICITA'05) IEEE.

Summer ME *Handbook of Soil Science* (CRC Press, 2000).

Tadesse W, Bishaw Z and Assefa S 'Wheat Production and Breeding in Sub-Saharan Africa: Challenges and Opportunities in the face of Climate Change' (2019) 11(5) *International Journal of Climate Change Strategies and Management*.

Taulli T *Artificial Intelligence Basics: A Non-Technical Introduction* (Apress, 2019).

Tevera D, Sibanda M, Mamba SF and Tivana LD 'Assessment of Cyclone Idia Floods on Local Food Systems and Disaster Management Responses in Mozambique and Zimbabwe' in Nhamo G and Chikodzi D *Cyclones in Southern Africa Volume 3: Implications for Sustainable Development Goals*.

Thorton J 'Precolonial African Industry and the Atlantic Trade, 1500–1800' (1990–1991) 19 *African Economic History* 1–19.

Tilva V, Patel J and Bhatt C 'Weather Based Plant Diseases Forecasting Using Fuzzy Logic' Nirma University International Conference on Engineering NUiCONE (2013) IEEE.

Tongwane MP and Moeletsi ME 'A Review of Greenhouse Gas Emissions from the Agriculture Sector in Africa' (2018) 166 Agricultural Systems 124–134.

Ugochukwu-Ibe IM and Ibeke E 'E-Learning and COVID-19. The Nigerian Experience: Challenges of Teaching Technical Courses in Tertiary Institutions' CEUR Workshop Proceedings (1613-0073) <https://rgu-repository.worktribe.com/output/1317762/e-learning-and-covid-19-the-nigerian-experience-challenges-of-teaching-technical-courses-in-tertiary-institutions>.

UN: 'East African Countries Better Prepared, but Desert Locust Threat "'Not Over"' (UN News, 19 January 2021).

Wassie SB, Mengistu DA and Birlie AB 'Agricultural Drought Assessment and Monitoring using MODIS-based Multiple Indices: The Case of North Wollo, Ethiopia' (2022) 194 *Environmental Monitoring and Assessment* 787–812.

Wild A *Soils and the Environment* (Cambridge University Press, 1993).

Winston PH and Brown RH (eds) *Artificial intelligence, An MIT perspective* (Cambridge: MIT Press, 1984).

WIPO: 'AI and IP Policy: The WIPO Conversation' <https://www.wipo.int/about-ip/en/frontier_technologies/ai_and_ip_policy.html>.

World intellectual Property and Intellectual Property Policy: 'Artificial Intelligence and Intellectual Property Policy' <https://www.wipo.int/about-ip/en/artificial_intelligence/policy_exhibition.html> (accessed 30 July 2023).

Young S 'The Future of Farming: Artificial Intelligence and Agriculture' (2000) 41(1) *Harvard International Review* 45–47.

Zamani AS, Anand L, Rane KP, Prabhu P, Buttar AM, Pallathadka H, Raghuvanshi A and Dugbakie BN 'Performance of Machine Learning and Image Processing in Plant Leaf Disease Detection' (2022) *Journal of Food Quality* 1–7.

Zhang N, Wang M and Wang N 'Precision Agriculture: A Worldwide Overview' (2002) 36 2–3 *Computers and Electronics in Agriculture* 113–132.

Zhao Z, Chow TL, Rees HW, Yang Q, Xing Z and Meng F-R 'Predict Soil Texture Distributions Using an Artificial Neural Network Model' (2009) 65(1) *Computers and Electronics in Agriculture* 36–48.

Chapter 15

The regulation of artificial intelligence tools for environmental impact assessment: Learning from the practice of impact analysis in French-speaking sub-Saharan Africa[1]

15.1 Introduction

To say artificial intelligence (AI) is shaping every aspect of human lives has now become a *truism*, as are the numerous calls for its regulation in several sub-fields. This chapter reflects from the vantage point of the use of AI to perform environmental impact assessments (EIAs).[2] These processes aim to manage potential impacts that intended development may cause to natural and human environments. In these processes, AI has quickly asserted itself as a way to perform complex tasks at expert performance levels, with the same efficiency as humans presented with comparable tasks. However, with the emergence of the era of 'big data', the use of AI to predict and evaluate environmental impacts requires a prospective reflection on the potential role of law in that field.

The chapter starts with a description of EIA's process, including the first generation of AI algorithms in the field, known as 'expert systems'. We then present 'preferred' tools in the geographical region retained for our analysis and the biases their deployment leads to. As a new generation of AI tools (AI 2.0) may be applied to EIA reports designed with the so-called 'preferred' tools, we highlight threats that they pose, especially on environmental protection and the protection of the rights of Indigenous Peoples and Local Communities over their genetic resources associated with traditional knowledge (TK). As we argue, the law can play an *ex ante* role in preventing the replication of biases embedded into technical tools deployed, mainly in Francophone

1 This chapter builds on the book chapter by Yentcharé P-y M 'De l'apport de l'analyse éthique pour une approche intégrée entre "nature" et "culture" dans les outils d'analyse des impacts environnementaux' in Guèvremont V (ed.) *Les approches intégrées de la protection des ressources culturelles et naturelles en droit national et international: Un état des lieux*. The authors thank all the reviewers for their valuable comments to improve this chapter.

2 It is worth noting that in several sub-Saharan Francophone countries, EIAs are rather referred to as 'Étude d'impact environnemental et social', which can be translated into English as 'environmental and social impact assessment or study'. See, e.g., Decree No. 96-894 of 8 November 1996, determining the rules and procedures applicable to studies of the environmental impact of development projects in Cote d'Ivoire; and Decree No. 2022-390 of 13 July 2022, organising environmental and social assessment procedures in the Republic of Benin.

sub-Saharan African countries, and an *ex post* role, in assigning responsibility where damages result from the use of AI algorithms.

15.2 Environmental impact assessments, methods and the first generation of artificial intelligence

Environmental impact assessment (EIA) is a process that aims at facilitating 'the systematic consideration of environmental issues as part of development decision-making. It does so primarily by assembling and analysing information on the potential environmental effects of specific development proposals and how they can be best prevented or mitigated.'[3] It was first established as a legal requirement by the National Environmental Policy Act[4] that provides for the obligation for American federal agencies to take environmental concerns into account in the design of the plans and activities.[5] Such requirement stems from a responsible stance that calls for adopting prudential measures as anthropogenic activities are renowned for adversely impacting both human and natural environments. Since then, several national laws have regulated EIAs, which has amounted to the status of a customary obligation in International Law.[6]

EIAs are carried out according to well-defined steps on which experts agree (see diagram 1). One of its critical phases is the *analysis* of the environmental impacts, which successively includes the identification of the impacts resulting from the implementation of the human activities envisaged and their evaluation. In practice, the methodology for identifying and evaluating requires approaches and technical tools designed by researchers or practitioners, the development of which is governed by no standard.

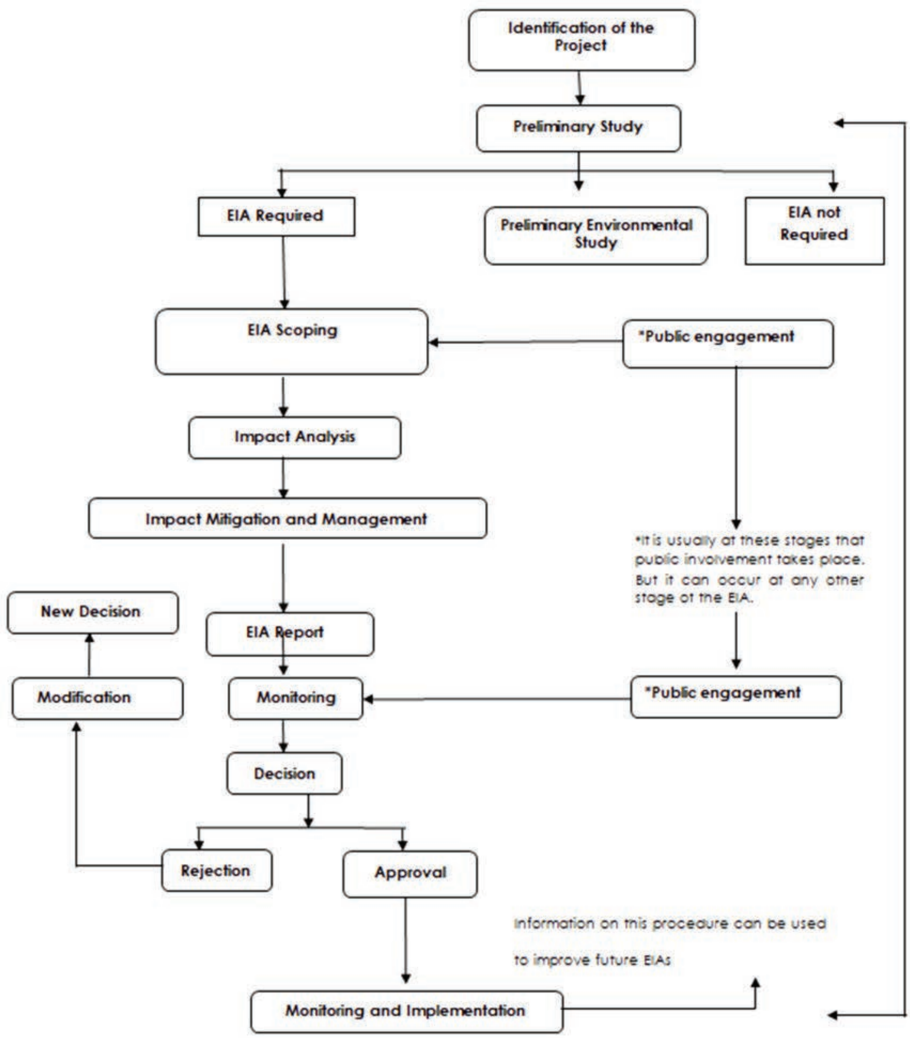
3 Abaza H, Bisset R and Sadler B *Environmental impact assessment and strategic environmental assessment: towards an integrated approach* at 40. See also Glasson J and Therivel R *Introduction to environmental impact assessment* 5th edn at 3.

4 Act of 1969 [42 USC § 4321] (NEPA) s 2.

5 Op cit. See also André P, Delisle CE and Revéret J-P *L'évaluation des impacts sur l'environnement: processus, acteurs et pratique pour un développement durable* at 27; and Yentcharé.

6 See Payne CR 'Environmental Impact Assessment as a Duty under International Law: The International Court of Justice Judgment on Pulp Mills on the River Uruguay' at 317–324.

Diagram 1: Overview of the EIA process



Source: UNEP: *Environmental Impact Assessment Training Manual* at 190.

There is a large body of literature on the tools and methods used in EIAs, among which are checklists, matrices, networks and systems, geographic information systems, overlay methods, simulation models, expert systems and ad hoc committees.[7] The

7 For a more detailed analysis of how each of these methods work, see André et al. at 249–290. Of course, other authors offer different typologies. E.g., Canter identifies the analog method, descriptive checklists, expert opinion and expert systems, laboratory and model testing, literature reviews, matrices, field monitoring studies, networks, and risk assessment as appropriate tools for conducting environmental impact identification activity. For [*continued on next page*]

table below provide a more or less exhaustive inventory of these tools, specifying the activities for which they are likely to be most relevant.[8]

Expert systems call for a detailed analysis, as they are the first application of AI in environmental impact analysis. Indeed, they try to simulate human intelligence through computer technology and robotics.[9] Geraghty described their functioning as:

> '[Expert systems] consist of three basic components (see Figure 1). The first component is the *knowledge base*, which contains information on facts, definitions, heuristics and computational procedures applicable to the field of knowledge to which the expert system is applied, here, EIAs. Second, there is the *inference engine*, which drives the *knowledge base* through reasoning processes which are similar to those of a human expert . . . The reasoning process uses what is known as an *interpreter* to decide how to apply the rules to infer new facts and conclusion and a *scheduler* to determine the order in which the rules should be applied . . . The third component is the *user interface*, which is the means by which the user communicates with the *knowledge base*. It allows the user to question the expert system and for the system to provide answers and clarification on points which may be unclear to the system user.'[10]

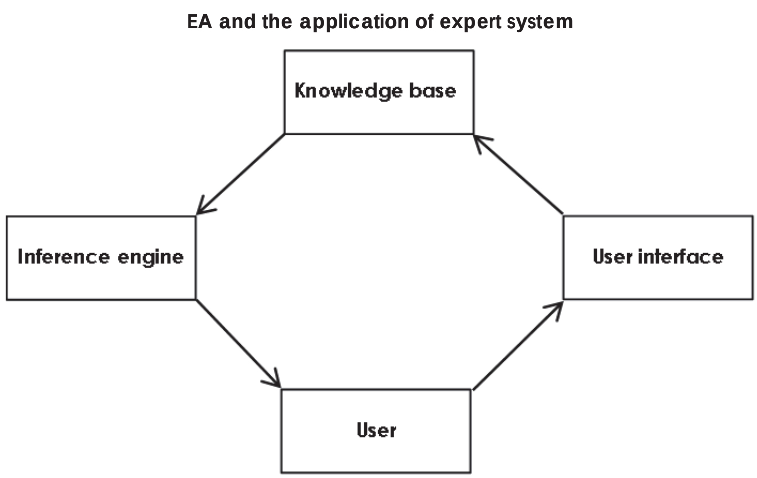


Figure 1. The basic components of an expert system.

As there are no rules governing expert systems development, several actors have designed such tools in various fields to provide solutions to problems within specialised fields, including in EIAs. For example, SCREENER was an expert system designed by a Canadian company to screen proposed development projects, whether initiated by federal developments, funded through federal agencies, or involving federal property.

[*continued from previous page*]

assessment, he suggests using the analog method, decision-oriented checklists, expert opinion, expert systems, indicators, landscape assessment, literature reviews, inventories, matrices, baseline monitoring, GIS mapping, and the risk assessment method. See Canter L 'Methods for Effective Environmental Information Assessment Practice' fn°6 at 60.

8 See Table 1: The appropriate tools for each phase of the EIA.

9 Hushon JM Overview of environmental expert systems at 2. See also Schmoldt DL 'Expert systems and the environment' at 243.

10 Geraghty PJ 'Environmental assessment and the application of expert systems' at 28–29.

ASSESSMAN was another expert system developed by a research centre in Japan to provide advice on various environmental issues. IMPACT is the US-designed screening expert system to assess construction projects' compliance with the NEPA. ORBI in the US relied on natural language processing to provide judgements about the suitability of a particular subject region for various uses (industry, agriculture, recreation).[11] BIO-EXPERT was another expert system used to control a wastewater treatment plant with failure detection and diagnosis[12] applications. The scientific literature has reported similar efforts to use expert systems in environmental protection.[13] All these tools share as main feature that they fall under the symbolic or cognitivist approach of AI, as they consist in creating meaningful automated mechanisms by a sequence of logical instructions desired by a programmer.[14]

In French-speaking sub-Saharan countries in Africa, EIAs have become more widespread due to the efforts of multilateral development banks and bilateral aid agencies, which have required them to be conducted as part of the projects they fund.[15] However, methods involving deploying expert systems as embryonic forms of AI in environmental assessment have not enjoyed equal popularity. Instead, the matrix tools have emerged in practice as recognised and accepted methods for analysing environmental and social impacts in Africa.[16] These matrix tools are relatively easy to use and do not require deploying any specific technology. The scientific expertise of the various members of the assessment team and sufficient practical experience seem to be elements that guarantee their effectiveness. Furthermore, matrices are relatively easy to understand as 'they provide a visual summary of the impact of projects' activities',[17] including by *ad hoc* Public Hearing Commissions.[18] More specifically, in practice, two tools, the American Leopold matrix and the French-Canadian Fecteau grid have gained consensus in the field of environmental impact analysis in this region.[19] We describe them below.

11 Ibid. at 29–33.

12 Lapointe J et al. 'Bioexpert – an expert system for wastewater treatment process'.

13 See, e.g., Guariso G and Werthner H *Environmental decision support systems*; Page B 'An analysis of environmental expert system applications' at 177–197; Maeda K 'An Intelligent Decision Support System for Activated Sludge Wastewater Treatment Processes'; Hushon JM 'Expert systems for environmental problems'.

14 Meneceur Y *L'intelligence artificielle en procès: plaidoyer pour une réglementation internationale et européenne* at 19.

15 André et al. at 12. See also Glasson J, Therivel R and Chadwick A *Introduction to environmental impact assessment* 3rd edn at 296; Sandham L, Retief F & Alberts R 'EIA best practice in Africa' at 332.

16 In fact, a quick review of numerous EIA reports freely available online often display matrices as tools deployed for the analysis (i.e., identification and evaluation) of environmental impacts.

17 André et al. at 263.

18 *Ad hoc* Public Hearing Committees are interdisciplinary boards responsible for the adoption of the EIA reports at the State level, after exerting a quality control of the EIA report designed by external consultants. E.g., they are instituted in Benin, Cote d'Ivoire, Togo. The point that matrices are easily understood in the context of EIA in sub-Saharan Francophone countries has been confirmed by Joel Agbemelo-Tsomafo, an expert in EIA Togo, during a semi-structured interview conducted on 24 October 2012.

19 See fn 18 above.

15.3 Preferred environmental impact analysis tools used in francophone sub-Saharan Africa

15.3.1 *Description*

(a) The Leopold matrix

The Leopold Matrix, one of the first comprehensive methodological efforts in the area of EIAs, was developed in 1971,[20] shortly after the NEPA came into force on 1 January 1970. It is a comprehensive, double-entry grid with two axes: a horizontal axis, which lists the development project-related activities being evaluated. This axis showcases a list of 100 possible activities or 'planned actions' or various human activities, organised following the project life cycle (development, construction, operation, and end-of-project phases). The vertical axis, on the other hand, includes 88 environmental elements (for example, natural or biophysical environment (air, water, flora, fauna, and soil) and human or cultural environment (workers, residents etc.)). Thus, the matrix generated from the two lists of parameters (100 activities × 88 elements of the environment) represents an immense grid offering a possibility of more than 8800 boxes, each of which constitutes the potential impact of the development project on the natural and human environment. Simply put, the potential impact stems from the cause-and-effect relationship between the project activities and the environmental components.

In practice, the final assessment performed by the EIA experts relies on two parameters: the magnitude of the impact and its significance. Measurement of the magnitude of the impact derives from criteria such as degree, extensiveness, and scale. As the value obtained for this parameter is considered independently of its context, it is usually referred to as the 'absolute importance'. For example, EIA experts might predict that since a highway construction will likely affect the wastewater drainage pattern, the potential impact will have a large absolute magnitude.[21] On the other hand, the degree of importance (that is to say, significance) – which is also referred to as the relative importance – considers the context in which the impact is inserted, that is to say, the persistence of the impact and the capacity of the receiving environment to be resilient as a result of the changes triggered by said impact. Thus, in the above case, it may appear that although the magnitude of the construction of a major road is estimated to be large, its relative importance is much smaller, either because the major road to be constructed is very short or because it will not affect a drainage pattern.[22]

Overall, each box representing potential impacts is divided by a diagonal. The top left of each box represents the magnitude of the impact, and the bottom right represents the importance of the impact. To estimate the impact according to the parameters of magnitude and importance, Leopold used a rating on a scale of 1 to scale from 1 to 10 in ascending order, respectively, from low to high impact. This rating also considers the positive or negative value of the impact. The final estimate of the overall potential impact is obtained by multiplying the two ratings per the following formula.[23]

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20 Leopold LB 'A procedure for evaluating environmental impact' 645.

21 Ibid. at 2.

22 Ibid.

23 Leduc GA and Raymond M *L'évaluation des impacts environnementaux: un outil d'aide à la décision* (2000) at 212.

MAGNITUDE OF THE IMPACT * IMPORTANCE OF THE IMPACT = FINAL IMPACT ESTIMATE

For example, if the EIA expert assigned a value of 2 to the magnitude of the impact and 3 to its relative importance, the overall impact would be estimated at 6 ($2 \times 3 = 6$).

The identification and evaluation of potential impacts, using the Leopold matrix, enable the proposal of an environmental and social management plan for the most significant impacts. This plan contains various corrective measures to mitigate the impact of the development project on the environment.[24] Typically, such measures consist of a series of complementary activities that must be implemented before, during and after the completion of the project to maintain a pleasant environment for both present and future generations.[25] In most cases, EIA experts in sub-Saharan Africa tend to use the Leopold matrix only to identify potential environmental impacts of the project.[26]

(b) The Fecteau grid

The Fecteau grid (1995) is often used in the Francophone sub-Saharan market to assess potential impacts identified through the Leopold matrix. Although the relevant literature on this tool is sparse,[27] available descriptions state that it is based on an integration of four parameters: duration, extensiveness, intensity (of the negative impact) and the value of the affected component. Once the first three parameters (duration, extensiveness, intensity) have been assessed, they are aggregated into a summary indicator to define the absolute importance or significance of the impact. The fourth parameter (value of the affected component) is added to the absolute significance to establish the relative importance.

The duration of the impact specifies the period during which the modifications undergone by the components of the environment will be felt. This parameter is measured on a scale of three values (short, medium and long). The extensiveness of the impact expresses the scope or spatial influence of the effects generated by an intervention on the environment. This notion refers either to the distance or the surface area over which the modifications undergone by a component will be felt or to the proportion of a population that will be affected by these modifications. It can be punctual, local, or regional. The intensity or degree of disturbance generated corresponds to the extent of the changes that affect the internal dynamics and function of the affected element of the environment. Intensity also is measured on a scale of three values:

24 Glasson and Therivel *Introduction to environmental impact assessment* 5th edn at 139–141.

25 Ibid.

26 A survey of environmental impact study reports in sub-Saharan Africa confirms this point. See e.g. Balde S ‘Rapport d’étude d’impact environnemental et social’ at 83; World Bank Funding: ‘Étude d’impact Environnemental Et Social (EIES) de 51,5 Km de Routes Ordinaires dans le Pôle de Croissance de Bagre’ at 20.

27 While abundantly referred to in several EIA reports, the only complete reference to the Fecteau grid we could find was inside a document authored by the Environmental Assessment Department of the Québec Ministry of Environment (Direction des Evaluations Environnementales du Ministère de l’Environnement du Québec): *Questions et commentaires*. . In this document, the reference of the Fecteau grid is: Fecteau M ‘Analyse comparative des méthodes de cotation des études d’impact environnemental’ at 119.

strong, medium, weak. In analysing the value associated with an impact, Martin Fecteau suggests that experts consider the social, economic and/or cultural importance that people attach to a resource and the ecological importance of that resource in the dynamics of the affected ecosystem at the local, regional, or national level. This value is rated on a three-point scale: low, medium and high.[28]

15.3.2 *Matrices in environmental impact assessments as flawed tools*

Although matrices are well-established for analysing environmental impacts in French-speaking sub-Saharan African countries, they are not perfect. Prior works have identified several issues with their deployment.[29]

(a) The systemic description's problem in matrix tools

Adequate identification of the possible impacts of a project on the environment presupposes an acute knowledge and accurate description of the biophysical and human environments that could be affected.[30] However, the empirical analysis shows that EIA experts do not always apply the same standards in identifying these elements. For example, while some experts simply list the biophysical features 'air', 'water', 'soil', 'fauna', and 'flora' likely to be affected, other EIA reports detail these, indicating their constituent parts.[31] Thus, for example, the medium 'air' includes the climate and the ozone layer on the one hand and the atmosphere on the other; the medium 'water' includes surface water and groundwater. The same applies to the presentation of the elements of the human environment. Indeed, some EIA reports present the reference system, that is to say the groups of individuals who will undergo a substantial change in their environment. However, it seems more relevant to target sub-categories such as socio-economic aspects, the living environment or even the elements of the infrastructure heritage that the implementation of the planned project could impact. Indeed, to state that employees, neighbourhoods, and traffic will be affected during the different phases of the project cycle[32] is probably less accurate than saying that the local economy, physical and real property, or cultural and archaeological heritage will be impacted.[33] Standardising practices for identifying the biophysical environment likely to be affected and promoting a greater detail in their components could be an appropriate first level of improvement. Such practices would result in more reliable data sets of potential environmental impacts with equivalent descriptions.

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28 The value is low if the impact affects a resource that is seasonally or all-season abundant, but not threatened with extinction; it is medium if the impact affects a resource whose regeneration and mutation time is relatively long (around 5 years). The value is high if it affects a resource whose regeneration and mutation time is long (greater than 5 years), a sensitive area or a resource threatened with definitive extinction.

29 See Yentcharé.

30 Ibid.

31 Ibid.

32 See below in Annex 1, Impacts identified with the Leopold matrix from the EIA report JAT Consulting, 'Projet de concassage de granite à Timbou dans la préfecture de Cinkassé (Nord-Togo)' at 45.

33 See below in Annex 2, Impacts identified with the Leopold matrix from an EIA guide Rainbow Environment Consult: 'Guide de réalisation et d'évaluation des études d'impact environnemental au Cameroun' at 56.

(b) The Fecteau grid's bias against indigenous peoples and local communities' traditional knowledge

As mentioned above, practice in French-speaking sub-Saharan African countries involves identifying with the Leopold matrix and Fecteau grid. At the onset, one may wonder whether impacts insufficiently or unclearly identified, even due to methodological errors or expert biases, could be effectively assessed. Logic suggests a negative answer. More importantly, the methodology of the Fecteau grid itself is problematic. As described above, it involves first determining absolute significance by the combined effect of the parameters of intensity, duration, and extensiveness of impact, then obtaining relative significance by aggregating relative significance with the value of the affected component. According to Martin Fecteau

> '[i]t is very important to distinguish clearly between the absolute importance of the impact, or its magnitude, and the relative importance of the impact. The former predicts the changes to the environment caused by the project based on objective knowledge and measurable variables, such as the duration, intensity, and extensiveness of the impact on the environment (impact characteristic). The latter is based on the value system of the individuals and communities concerned, which can be analyzed objectively . . . Thus, to assess the relative importance of an impact, one first determines the magnitude of the impact on the affected environment. We contrast this magnitude with the value of the affected environment or resource. It is, therefore, essential to determine the magnitude of the impact first before considering the value of the resource in the impact rating to avoid confusion.' (Fecteau, 1997)

Given that it is accepted that the three criteria for establishing absolute impact significance (duration, intensity, and extensiveness) have a value of one-third ($^1/_3$), one could make the following analysis:

Let us consider that the impact of a project on the environment has a symbolic value of 1. If four parameters intervene equally to measure it, it seems fair to state that each parameter contributes for a quarter ($^1/_4$). It should be remembered here that the value of the affected component, the last parameter for establishing the relative importance of the impact, includes two elements: the ecosystem value and the economic, social and cultural value. The underlying premise of the two assumptions below is that an optimal situation is assumed in which the impact's economic, social and/or cultural importance (referred to here as social importance, broadly defined) is equivalent to its ecosystem importance.

- *Hypothesis 1:* If the value of the affected component is $^1/_4$ of the relative importance of the impact, its social importance would be $^1/_8$ of the relative importance. In this simulation, the 'value system of the individuals or communities involved' is worth ⅛ in evaluating a potential impact.
- *Hypothesis 2:* Consider, however, that the value of the affected component is an autonomous criterion in itself, with a symbolic value of 1 (then equivalent to the absolute importance of the impact, which is also 1, since it results from the aggregation of three parameters with a value of $^1/_3$). The 'value system of the individuals or communities concerned' in the relative importance of the impact would have a value of ½. In contrast, that of all the other different parameters of this value system (thus the absolute importance evaluated objectively by the experts and the ecosystemic importance that comes more from their scientific knowledge) is worth $^3/_2$ (absolute importance (1) + ecosystem importance ($^1/_2$) = ($^3/_2$).

Regardless of the method chosen, and contrary to Martin Fecteau's opinion that they can be analysed 'objectively', the human dimensions are insufficiently factored into the evaluation methodology he proposes, even if they are not ignored. This analysis is corroborated by several authors who argue that matrices are characterised by 'a limited focus on the human elements of the environment in their composition'.[34] Perhaps one should understand that in its essence, the Fecteau grid leads to an 'abandonment of the citizen [which] stems from an ever-greater control of all aspects of their life by institutions and experts', as Jurdant courageously states it.[35] Doesn't the grid of Fecteau, in its principle, conceive that the environment offers itself as a transparent object to the quasi-sovereign manipulation of the expert, even though society is a permanent collective intersubjective performance?[36]

Furthermore, both the Léopold matrix and the Fecteau grid do not allow for the identification and evaluation of induced and cumulative impacts of projects.[37] This is because they are limited to first-order impacts.[38] For example, they only allow for the analysis of noise impacts that may result from the implementation of the rock blasting activity in a crushing project. But because of how they are constructed, they are silent on the impacts on human health or the subsequent migration due to the noise created by such explosions.

(c) The rating system's problem

In the Leopold matrix, and beyond any pedagogical relevance, the idea of assigning a value to the magnitude and relative importance of an impact to obtain a final estimate reveals a characteristic intrinsic to all evaluation work: the place of subjectivity. The Fecteau grid, which has criteria specific to the parameter being analysed, is no exception. In fact, against the background of an impact analysis, a member X of the team of experts could consider that the absolute significance of the impact is worth 6 and the relative significance is 8, on a 1 to 10 scale. The total value of this impact would then be 48. One may ask, however, on what grounds such values have been provided. As for the absolute significance of the impact, it is expected that this expert relies on this technical knowledge, experience, and status of the initial state of the project location, which should be analogous to a colleague's assessment. However, values for the relative significance necessarily call for the perception of such an expert and may vary depending on his *habitus*.[39]

The same goes when the evaluation of environmental impacts is carried out with the Fecteau grid. Even though the corresponding methodology claims to be objective, how may one distinguish, from evaluator X to evaluator Y, for example, local extensiveness from a regional one? Analysis of the value of the affected component is trickier as experts may consider that the ecosystemic value is low (because it indicates, for example, that the soil is poor) while indigenous peoples and local communities consider the same impact's economic, social, and cultural value to be 'high'. From a theoretical

34 André et al. at 263. See also Sandham, Retief & Alberts at 332.
35 Waaub J-P 'Michel Jurdant : un écologue doublé d'un écologiste, un citoyen militant reconnaissance son pire adversaire, l'expert technocrate qui est en lui' at 142.
36 Vallaeys F 'Les fondements éthiques de la Responsabilité Sociale' at 160.
37 André et al. at 263.
38 Ibid.
39 Wagner A-C 'Habitus'.

standpoint, these two are irreconcilable per Kenneth Arrow's impossibility theorem, which suggests that the *dictator*, that is to say the most influential person among the actors involved, will see his evaluation triumph over those of his colleague. EIA experts, well aware of the methodological biases associated with this degree of subjectivity in their analysis, use tools such as the Delphi survey[40] to mitigate its effects, although it also has several shortcomings.[41]

Moreover, the highly subjective characteristic of these matrix tools is expressed through the assignment of 'positive' and 'negative' values that qualify the impacts. It is fair and relatively simple to consider the release of cyanide into a water body negatively impacting both biophysical and human environment. But it is much more complex to qualify as 'positive' or 'negative' the destruction of a fetish that has become a source of conflict in a community where the spiritual values between young and old are no longer the same or the removal of sacred trees or the clearing of plants whose secrets are known to women and which make them financially independent from the men in a community where gender equality is not valued. Indeed, what is 'positive' for one may be 'negative' for another, and what is considered 'positive' today may turn out 'negative' in the future. Thus, the near-totalising feature of these predicates ('positive' and 'negative') constitutes a major flaw in these matrix tools.

(d) The underlying ethical logics of the Leopold matrix and the Fecteau grid

Prior research has established that the Leopold matrix is based on environmental ethics that sustains that '[a] thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.'[42] In this worldview, Nature is celebrated for its intrinsic value, not for its benefits to human beings. This makes it close to the philosophy of deep ecology, which also values nature beyond any utilitarian consideration. This ideology is valid and respectable, but it becomes questionable when it underlies an environmental impact analysis tool that is supposed to contribute to humanly sustainable development. Indeed, deep ecology is based on the presupposition that nature necessarily suffers from the destructive assaults of humanity, which seeks in a greedy way to ensure its happiness at the expense of other species of nature. The assessments would only attest to the destructive side of the development that humans seek, which should be mitigated and tempered by mitigation or compensation measures. This is why the EIA reports focus mainly on what appears to be harmful to find a remedy.[43] Described as such, it is evident that deep ecology as an ethical value underlying tools for analysing environmental impacts is not very coherent with the idea of development in which the human being is the core, not the superior element.[44] No component of the natural environment can be put in a symmetrical relation with human beings, both in action and in language. Thus, the environment and its components (natural and cultural) cannot claim the political status

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40 See Barrett D and Heale R 'What are Delphi studies?'

41 Leduc and Raymond at 200.

42 See Luna Leopold Biography.

43 This analysis is consistent with one opinion held about EIAs, which usually only examine or look at the possible negative consequences of a project on the environment. For more detail, see Modak P and Biswas AK *Conducting environmental impact assessment in developing countries* at 12.

44 Dubois J-L and Lasida E 'A new style of development to deal with the current crisis: solidarity-based economy, collective capability and sustainable human development' at 35–56.

that would make them responsible for the world's future like humans. This strips nature of any intrinsic value it might possess. Leopold's matrix does not fall into the excesses of deep ecology. Still, the analysis at least invites us to reverse the priorities and put human beings back at the centre of impact analysis' tools.

It has already been established that the Fecteau grid only provides for a limited consideration of Indigenous Peoples and Local Communities' TK during EIAs. The fact that the value system of individuals and communities is considered after the expert's intervention suggests that the place given to the *others* is not central, notwithstanding the process of public participation, which ratifies the 'social' aspect of sustainable development within EIAs. The nuance is crucial.

This expresses a 'technician's ethic' that shapes the Fecteau grid: it is up to 'experts' to provide a credible value to an environmental impact. The 'technician' relies on the prestige of his knowledge to decide on the 'truth' of the assessment he is conducting. Others are invited into this rational activity only insofar as scientific reason allows it and at the time she chooses. Technician ethics is not in itself flawed. Indeed, from various points of view, we recognise the benefits of science and technology, which, by rationalising nature to obtain the maximum benefits, provide an appreciated comfort to humanity. Reservations are only voiced when it becomes clear that the Fecteau grid leads to an 'abandonment of the citizen [which] results from an ever-greater assumption of the management of every aspect of his life by institutions and experts'.[45] Indeed, it is less a question of knowing which of scientific expertise or TK is the most valid knowledge system than the most legitimate one to analyse environmental impacts.

15.4 Environmental impact assessments, methods and artificial intelligence tools

Between 1970 and 1990, research and development in AI, which was the exclusive apanage of the symbolic trend, has, by a strange twist of history, been confiscated since 2010 by their 'connectionist' challengers (historically despised by the supporters of the symbolic approach).[46] The connectionist approach, inspired by the physics of the brain itself, automatically induces constants (rules) by examining a series of data with a radically different intervention of the designer, who guides the AI in discovering (what is referred to as learning) rather than instructing it how to behave. The advent of this new wave in the AI field is renewing how environmental assessments are conducted.[47] For example, a recent work by Koyamparambath et al. propose using machine learning to predict the environmental performance of construction products or services to assist

45 Jurdant M *Jurdant in Le défi écologiste*, cited by Waaub at 7–8.

46 Meneceur at 19–21.

47 In general, authors tend to agree that while AI cannot be a panacea, especially for complex environmental issues raised by human activities in several sectors, it can foster sustainability. See, e.g., Nishant R, Kennedy M and Corbett J 'Artificial intelligence for sustainability'; Qi C 'Big data management in the mining industry' at 131–139; Li J and Zhan K 'Intelligent mining technology for an underground metal mine based on unmanned equipment' at 381–391; Gerassis S et al. 'Understanding complex blasting operations: A structural equation model combining Bayesian networks and latent class clustering' at 195–204.

life cycle assessment practitioners and auditors.[48] They used natural language to process relevant data, which is then used to train an algorithm. They found that the model could predict the values of impact categories: global warming potential, abiotic depletion potential for fossil resources, acidification potential, and photochemical ozone creation potential with an accuracy of 81%, 77%, 68%, and 70%, respectively.[49] Wenwen Liu et al. designed an AI-based method to analyse the data measured in environmental assessment processes.[50] They argue this method bears significant operational, economic, business, social, and community-based environmental evaluation and control systems benefits.[51] Liu and Yu in Taiwan had already shown that comprehensive use of several AI technologies (such as case-based reasoning (CBR) for retrieval of similar environmental impact statements (EISs) and EIA reports (EIARs) stored in computerised systems; fuzzy reasoning for qualitatively predicting risks for possible review results; and importance-performance for analysing weak points in EISs or EIARs) are beneficial for environmental risk management.[52] AI also proved relevant to predicting the environmental impacts of paddy production.[53]

While one may reasonably argue that the use of AI to perform environmental assessments is yet to be a common practice, especially in Francophone sub-Saharan Africa, the pervasiveness of this technology that shapes all aspects of people's everyday lives suggests that it will also reach the field of environmental assessments on the continent. It is anticipated that, among other things, natural language processing will be deployed to find patterns, extract relevant information from EIA reports and train algorithms for the analysis of environmental impacts.[54] Against this background, ChatGPT,[55] among other AI tools, is expected to be significantly used, especially by EIA consulting firms to address the lack of information pertaining to specific projects on the environment they do not have experience on yet, and to expedite EIA processes to save valuable time.[56] In effect, given the many potential benefits of AI technology, the

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48 Koyamparambath A et al. 'Implementing Artificial Intelligence Techniques to Predict Environmental Impacts: Case of Construction Products', *Abstract*.

49 Ibid. at 7.

50 Liu W et al. 'Intelligent comprehensive evaluation system using artificial intelligence for environmental evaluation'.

51 Ibid. at 8.

52 Liu K F-R and Yu C-W 'Integrating case-based and fuzzy reasoning to qualitatively predict risk in an environmental impact assessment review' at 1251.

53 Nabavi-Pelesaraei A et al. 'Integration of artificial intelligence methods and life cycle assessment to predict energy output and environmental impacts of paddy production' at 1279–1294.

54 See, e.g., Wu Z 'Application of Natural Language Processing in Environmental Protection Industry Based on Monte Carlo Tree' at 052001.

55 OpenAI: 'ChatGPT', an AI based on natural language processing (NLP) launched in November 2022 by OpenAI in San Francisco, USA. This AI relies on extensive training with huge multilingual datasets, allowing it to generate textual responses like those of humans. ChatGPT belongs to the category of chatbots, programs that can understand and respond via a text-based interface. It is built on the Transformer Pre-Trained Generator (GPT) architecture and sparks discussions about its potential as the tech industry's 'next big disruptor', possibly even making search engines such as Google obsolete. For more detail see OpenAI: 'Models GPT-3'. See also Brown T et al. 'Language models are few-shot learners' at 1877–1901.

56 Metz C and Grant N 'A New Chat Bot Is a "Code Red" for Google's Search Business'. For a similar analysis see Kshetri N 'ChatGPT in developing economies' at 17–18.

resulting advantages for the optimised analysis of environmental impacts of development projects will likely consist in the speed and (presumed) efficiency of predicting development projects' social and environmental impacts. The accuracy of these predictions is facilitated by numerous freely available EIA reports, which constitute valuable datasets for training AI algorithms purposefully built for this end.

However, AI 2.0 systems applied to EIAs also present significant risks to safeguarding human rights, the protection of which is at the core of the requirement to perform environmental assessments. As they can parrot large databases of human speech but cannot distinguish true from false or ethical from unethical, they are prone to perpetuating stereotypes and biases embedded into tools such – as matrixes – they attempt to imitate. This statement is a resounding echo of the concept of 'garbage in, garbage out' (GIGO), common to computer science and mathematics, which asserts that the input's quality determines the output's quality.[57] AI's effect would be to magnify the biases already catalogued by critical studies on the analysis of environmental impacts. As Sadin puts it, AI

> 'sets itself up as an *aletheic* power, a power dedicated to exposing *aletheia*, the truth, in the sense defined by ancient Greek philosophy understood as the unveiling, the manifestation of the reality of phenomena beyond their appearances. It stands up as an apparatus qualified to appraise what is real in a more reliable way than [humans], revealing to us dimensions hitherto veiled from our conscience[58] [emphasis added].'

Indeed, the currently dominant approach of AI – connectionism, which claims to reveal the hidden rules governing the world through massive data and information processing, actually borrows the strengths and weaknesses of its mathematical and statistical driver. In EIA, this capacity of enunciation of the truth leads to manufacturing a representation of the real world, as described, but also distorted one, thanks to the rigour of this underlying mathematical and statistical driver. To put it differently, AI applied to environmental impact analysis powered by matrix tools will attempt to mimic human reasoning with the hope that with sufficient observations, it will be able to reproduce its characteristics with acceptable probabilities. However, this would equate to valuing correlation over causation, thus reinstating the *disturbing* dream of a radical induction, according to which, with reproducible objective observations and rigorous reasoning, there would be no need to rely on scientific theories.[59] Whereas answers without theory lead us to accumulate a significant 'intellectual debt', the complexity of which will increase in proportion to the multiplication and the entanglement of the systems.[60] One can already measure the importance of such a debt in a context where Leopold's matrix' ethics – which is close to the deep ecology – does not allow for efficient measurement of the impacts on the human environment, and the technician ethics of the Fecteau grid leads to the marginalisation of the holders of TK. Against this background, the intervention of the law is needed to put humans back at the heart of the decision-making process relating to AI-enhanced EIAs.

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57 For more detail see Jake Silberg J and Manyika J 'Tackling bias in artificial intelligence (and in humans)'.

58 Sadin É *L'intelligence artificielle ou l'enjeu du siècle: anatomie d'un antihumanisme radical* at 13.

59 Anderson C and Dauzat PE 'La fin de la théorie' at 119–122.

60 Meneceur at 177–269.

15.5 The role of the law

As in many instances, the role of law is often to mediate and temper the excesses of technology that were unanticipated in their design and deployment. Applying AI systems to environmental impacts analysis fits such conceptualisation of law as an apparatus external to technological artifacts, the development and usage of which it lags behind. Yet, in the case of Francophone African sub-Saharan countries, the alleged delay in deploying such AI systems stands as an opportunity to update EIAs' regulations consistently with sustainable development principles in our age of algorithmic governmentality.[61] To contribute to the reflection on these regulations, we lay below a few suggestions, on how improving environmental regulations and harnessing tort regulations could foster cross-fertilisation with AI-related regulations.

Principles are essential to design regulations, including those applicable to environmental technologies. The common thread of *ex ante* role of the law is to enhance the participation of each human personally in environmental impacts' analysis so that AI algorithms are deployed on 'clean' EIAs datasets, thus increasing their predictive capabilities. Thus, we argue that the regulatory approach to using AI systems in EIAs should be rooted in the concept 'heuristics of fear' by Jonas, which calls for letting the fear of the unknown consequences of new technologies on humans steer their way of life.[62] Feeling such fear would make human beings experience the price of life, and the danger thus recognised would reveal the value of what is threatened, namely, the degradation of human environments and the loss of TK.[63] The legal equivalent of this notion is the precautionary principle, the importance of which is increased by the fact that it is not clear that the developers of AI algorithms for predicting environmental and social impacts have an acute knowledge of the biases to which the matrices lead. Prosaically, this means that legal actors and policymakers should consider strengthening relevant environmental law rules incorporating the precautionary principle and creating new abiding regulations for AI system developers. We also argue that the model 'ethics of discussion' by Apel[64] and Habermas[65] is relevant to mitigating the expert-centred feature of the Fecteau grid (and, to some extent, of the Leopold matrix). According to the grid, only those norms likely to be accepted by all concerned participants in a practical discussion can claim validity. From a legal perspective, it is an opportunity to leverage existing environmental regulations on indigenous peoples and local communities' free, prior, and informed consent for the ethical use of AI in EIAs. From a pragmatic standpoint, this implies a genuine mapping of representative and equitable sampling of stakeholders who are legitimate to define the meaning and direction they want to give to their history; and allowing the participation of these stakeholders in the actual analysis of environmental impacts: for example, for the assessment carried out using the Fecteau grid, each of the parameters of absolute significance (that is to say intensity, duration and extensiveness) would be factored into the community value system. Under these conditions, the scoring rule would no longer be an addition but closer to a multiplication. The final result of the impact assessment

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61 Rouvroy A 'Algorithmic governmentality and the death of politics'.

62 Jonas H *Le principe responsabilité : une éthique pour la civilisation technologique*.

63 Droz Y and Lavigne J-C *'Éthique et développement durable'* at 9.

64 Apel K-O 'Éthique de la discussion'.

65 Habermas J and Bouchindhomme C *Morale et communication: conscience morale et activité communicationnelle*.

would simply be the average value between the knowledge of the affected communities and the knowledge of the experts.

Ex post, the regulation of the use of AI systems in the context of environmental impact analysis should be based on clearly established liability rules. As the control to predict such impacts are – totally or partially – delegated to algorithms, one may argue that these technological artifacts also bear the responsibility arising from damages caused by their use.[66] This conceptually loaded statement presupposes that AI systems have the moral agency[67] necessary to be attributed responsibility. Symmetrically and consistently with the debate on the Law of non-humans,[68] we argue that rather than speculating on the ability of AI algorithms competent to predict environmental and social impacts to have this moral agency, it would be appropriate for the regulations to place responsibility on humans involved in deploying AI.[69] Consequently, the Law should designate first experts deploying AI algorithms, and second, designers of such systems as liable for the damages arising from the poor prediction of environmental and social impacts. Such liability should be independent of the deep-learning capabilities of these algorithms, which could theoretically lead to evaluations beyond what is objectively expected of a human evaluator.[70] We hypothesise that such a level of severity in appropriate regulation will stand as an invitation for designers and EIA to be filled with ‘fear’ as Jonas advises us to, all useful for carefully deploying AI algorithms in environmental impact analysis.

15.6 Conclusion

The use of AI algorithms in environmental assessments is not a new phenomenon. The earliest observed forms of AI (expert systems) strived to improve the way EIAs were conducted by simulating experts’ reasoning. Nowadays, the availability of big data, typical of the connectionist era of AI, suggests a potential improvement in predicting environmental impacts. Such prediction can be made through the natural language processing of freely available EIA reports. However, as these reports are not flawless, AI in environmental impact analysis runs the risk of amplifying the biases they contain since algorithms are essentially ‘idiot scientists’.

The present study has attempted to highlight the biases to which the use of the Leopold matrix and the Fecteau grid, two tools that are widely used in practice in French-speaking sub-Saharan African countries, leads. It demonstrates that the replication of biases identified by potential AI systems is likely to limit the place of politics – that is to say the human factor – in the analysis of environmental impacts. This situation is particularly preoccupying when one considers that indigenous peoples and local communities’ TK only participates in a tiny portion of the production of impact

66 Constantinescu M et al. ‘Understanding responsibility in Responsible AI. Dianoetic virtues and the hard problem of context’ at 1–12.

67 Moral agency is a normative concept, in that an entity can be a moral agent only if its actions are governed by moral standards which generate moral duties or obligations. See Himma KE ‘Artificial agency, consciousness, and the criteria for moral agency: What properties must an artificial agent have to be a moral agent?’ at 19–29.

68 See Vallaeys.

69 Constantinescu et al. at 1–12.

70 Okolo CT, Aruleba K and Obaido G ‘Responsible AI in Africa – Challenges and Opportunities’ at 37.

assessments. Finally, it emphasises the *ex ante* and *ex post* role that the law should play in regulating the AI systems deployed in environmental impact analysis. There is still time for African countries to take such a path to contribute to a sustainable development for all.

15.7 References

Abaza H, Bisset R and Sadler B *Environmental impact assessment and strategic environmental assessment: towards an integrated approach* (UNEP: Earthprint, 2004).

Anderson C and Dauzat P-E 'La fin de la théorie' *Le Débat* 2019.5 119–122.

André P, Delisle CE and Revéret J-P *L'évaluation des impacts sur l'environnement: processus, acteurs et pratique pour un développement durable* (Presses inter Polytechnique, 2010).Apel K. -O 'Éthique de la discussion', coll. "Humanités" (Éditions du Cerf, 1995).

Balde S 'Rapport d'étude d'impact environnemental et social' of the 'Programme d'Appui à la Transformation de l'Agriculture Guinéenne/Volet Entreprenariat Agricole des Jeunes (PATAG-EAJ)' (funded by the African Development Bank) (September 2018) <https://esa.afdb.org/sites/default/files/Rapport%20Etudes%20d'Impact%20Environmental%20et%20Social%20%20PATAG.pdf>.

Barrett D and Heale R 'What are Delphi studies?' *Evidence-based nursing* 23 Royal College of Nursing, 2020.

Brown T, Mann B, Ryder N, Subbiah M, Kaplan JD, Dhariwal P & Amodei D 'Language models are few-shot learners' *Advances in neural information processing systems* (2020) 33 1877–1901.

Canter L 'Methods for Effective Environmental Information Assessment Practice' in Porter AL and Fittipaldi JJ *Environmental Methods Review: Retooling Impact Assessment for the New Century*.

Constantinescu M, Voinea C, Uszkai R and Vică C 'Understanding responsibility in Responsible AI. Dianoetic virtues and the hard problem of context' *Ethics and Information Technology* 2021.1–12 doi: 10.1007/s10676-021-09616-9.

Drake RAR *Instrumentation and control of water and wastewater treatment and transport systems* (Elsevier, 1985).

Droz Y and J-C Lavigne 'Éthique et développement durable' (KARTHALA Éditions, 2006) (accessed 18 June 2023).

Dubois J-L and Lasida E 'A new style of development to deal with the current crisis: solidarity-based economy, collective capability and sustainable human development' 11-1 *Revue de Philosophie Économique* (2010) 35–56.

Enoksson P *IOP Conference Series: Materials Science and Engineering* 612 (IOP Publishing, 2019).

Environmental Assessment Department of the Québec Ministry of Environment (Direction des Évaluations Environnementales du Ministère de l'Environnement du Québec): *Questions et commentaires* Programme décennal de dragage d'entretien des installations portuaires de la compagnie minière IOC à Sept-Îles Dossier 3211-02-21, Février 2004.

Fecteau M 'Analyse comparative des méthodes de cotation des études d'impact environnemental, rapport de recherche' (Montréal: University of Québec, February 1997).

Geraghty PJ 'Environmental assessment and the application of expert systems: an overview' (1993) 39-1 *Journal of Environmental Management* 27–38.

Gerassis S, Albuquerque MTD, García JF, Boente C, Giráldez E, Taboada J and Martín JE 'Understanding complex blasting operations: A structural equation model combining Bayesian networks and latent class clustering' 188 *Reliability Engineering & System Safety* (2019) 195–204.

Glasson J and Therivel R *Introduction to environmental impact assessment* 5th edn coll The natural and built environment series (New York: Routledge, 2019).

Glasson J, Therivel R and Chadwick A *Introduction to environmental impact assessment* 3rd edn coll The natural and built environment series (London: Routledge, 2005).

Guariso G and H Werthner *Environmental decision support systems* (John Wiley & Sons Inc, 1989).

Guèvremont V (ed.) *Les approches intégrées de la protection des ressources culturelles et naturelles en droit national et international: Un état des lieux* (University of Laval Press, forthcoming, 2023).

Habermas J and Bouchindhomme C *Morale et communication: conscience morale et activité communicationnelle* (Paris: Flammarion, 1986).

Himma KE 'Artificial agency, consciousness, and the criteria for moral agency: What properties must an artificial agent have to be a moral agent?' 11-1 *Ethics and Information Technology* (2009) 19–29.

Hushon JM 'Expert systems for environmental problems' 21-9 *Environmental Science & Technology* (1987) 838–841 doi: 10.1021/es00163a604.

Hushon JM *Overview of environmental expert systems* (ACS Publications, 1990).

JAT Consulting: 'Projet de concassage de granite à Timbou dans la préfecture de Cinkassé' (Nord-Togo) 'Rapport d'étude environnemental et social' 38 No 8-2012, Agence nationale de gestion de l'environnement, 2012.

Jonas H *Le principe responsabilité : une éthique pour la civilisation technologique* (Paris: Éditions du Cerf, 1990) <http://ariane.ulaval.ca/cgi-bin/recherche.cgi?qu=01-1475344>.

Kshetri N 'ChatGPT in developing economies' (2023) 25-2 *IT Prof.* 16–19.

Koyamparambath A, Adibi N, Szablewski C, Adibi SA and Sonnemann G 'Implementing Artificial Intelligence Techniques to Predict Environmental Impacts: Case of Construction Products' 14-6 *Sustainability* (2022) 3699.

Lapointe J, Marcos B, Veillette M, Laflamme G and Dumontier M 'Bioexpert – an expert system for wastewater treatment process diagnosis' 13-6 *Computers & Chemical Engineering* (1989) 619–630 doi: 10.1016/0098-1354(89)80001–8.

Leduc GA and Raymond M *L'évaluation des impacts environnementaux: un outil d'aide à la décision* (Montréal, Éditions multimondes, 2000).

Leopold LB 'A procedure for evaluating environmental impact' 645 (US Department of the Interior, 1971).

Li J and Zhan K 'Intelligent mining technology for an underground metal mine based on unmanned equipment' 4-3 *Engineering* (2018) 381–391.

Liu K F-R and Yu C-W 'Integrating case-based and fuzzy reasoning to qualitatively predict risk in an environmental impact assessment review' 24-10 *Environmental Modelling & Software* (2009) 1241–1251.

Liu W, Zhao J, Du L, Padwal HH and Vadivel T 'Intelligent comprehensive evaluation system using artificial intelligence for environmental evaluation' 86 *Environmental Impact Assessment Review* (2021) 106495.

Luna Leopold Biography <https://www.notablebiographies.com/newsmakers2/2007-Co-Lh/Leopold-Luna.html#ixzz2Dc9Nhd8M>.

Maeda K 'An Intelligent Decision Support System for Activated Sludge Wastewater Treatment Processes' in Drake RAR *Instrumentation and control of water and wastewater treatment and transport systems*.

Meneceur Y *L'intelligence artificielle en procès: plaidoyer pour une réglementation internationale et européenne* [s l] (Bruylant, 2020).

Metz C and Grant N 'A New Chat Bot Is a "Code Red" for Google's Search Business' *The New York Times* (21 December 2022) <ChatGPT and Other Chat Bots Are a 'Code Red' for Google Search - The New York Times (nytimes.com)>.

Modak P and Biswas AK *Conducting environmental impact assessment in developing countries* (United Nations University Press, 1999).

Nabavi-Pelesaraei A, Rafiee S, Mohtasebi SS, Hosseinzadeh-Bandbafha H and Chau K 'Integration of artificial intelligence methods and life cycle assessment to predict energy output and environmental impacts of paddy production' 631 *Science of the Total Environment* (2018) 1279–1294.

Nishant R, Kennedy M and Corbett J 'Artificial intelligence for sustainability: Challenges, opportunities, and a research agenda' 53 *International Journal of Information Management* (2020) 102–104.

Okolo CT, Aruleba K and Obaido G 'Responsible AI in Africa – Challenges and Opportunities'2023 at 35–64.

OpenAI: 'ChatGPT' (2022) <Introducing ChatGPT (openai.com)>.

OpenAI: 'Models GPT-3' <https://beta.openai.com/docs/models>.

Page B 'An analysis of environmental expert system applications' 5-4 *Environmental Software* (1990) 177–197.

Payne CR 'Environmental Impact Assessment as a Duty under International Law: The International Court of Justice Judgment on Pulp Mills on the River Uruguay*' 1-3 *European Journal of Risk Regulation* (2010) 317–324 <doi: 10.1017/S1867299X00000532>.

Porter AL and Fittipaldi JJ *Environmental Methods Review: Retooling Impact Assessment for the New Century* (Fargo North Dakota USA: The Press Club, 1998).

Qi C 'Big data management in the mining industry' 27-2 *International Journal of Minerals, Metallurgy and Materials* (2020) 131–139.

Rainbow Environment Consult: 'Guide de réalisation et d'évaluation des études d'impact environnemental au Cameroun' (2008).

Rouvroy A 'Algorithmic governmentality and the death of politics' 27 *Green European Journal* (2020), 1-9.

Sadin É *L'intelligence artificielle ou l'enjeu du siècle: anatomie d'un antihumanisme radical* coll Collection Pour en finir (Paris: L'Échappée, 2018).

Sandham L, Retief F & Alberts R 'EIA best practice in Africa' in *Handbook of Environmental Impact Assessment* at 332.

Schmoldt DL 'Expert systems and the environment' *Encyclopedia of Environmental Science* (1999) 243.

Silberg J and Manyika J 'Tackling bias in artificial intelligence (and in humans)' *McKinsey Global Institute* (2019) 1-9.

UNEP: *Environmental Impact Assessment Training Resource Manual* 2nd edn (2002).

Vallaeys F 'Les fondements éthiques de la Responsabilité Sociale' [microfiche] (University of Paris-Est: PhD Thesis, 2011).

Waaub J-P 'Michel Jurdant : un écologue doublé d'un écologiste, un citoyen militant reconnaissance son pire adversaire, l'expert technocrate qui est en lui' 29-76 *Cah Géographie Québec* (1985) 137–145.

Wagner A-C 'Habitus' *Sociologie* (2012) <http://journals.openedition.org/sociologie/1200>.

World Bank Funding: 'Étude d'impact Environnemental Et Social (EIES) de 51,5 Km de Routes Ordinaires dans le Pôle de Croissance de Bagre' (December 2016) <https://documents1.worldbank.org/curated/pt/403261485762939555/pdf/SFG2895-V2-EA-FRENCH-P161234-Box402880B-PUBLIC-Disclosed-1-23-2017.pdf>.

Wu Z 'Application of Natural Language Processing in Environmental Protection Industry Based on Monte Carlo Tree' in Enoksson P *IOP Conference Series: Materials Science and Engineering*.

Yentcharé P-y M 'De l'apport de l'analyse éthique pour une approche intégrée entre "nature" et "culture" dans les outils d'analyse des impacts environnementaux' in Guèvremont V (ed.) *Les approches intégrées de la protection des ressources culturelles et naturelles en droit national et international: Un état des lieux*.

Table 1: The appropriate tools for each phase of the EIA[71]

Phases of EIA	Lists	Matrices	Networks	Superpositions	Models	Decision support methods	GIS	Expert systems
Preliminary screening	+	+						+
Framing	+	+	+	+	+		+	+
Conduct of the study Description of the environment	+	+	+	+	+		+	+
Determination of impacts	+	+	+		+		+	+
Prediction of changes					+			+
Impact assessments				+	+		+	+
Identification of mitigation measures	+							+
Mitigation assessments					+	+	+	+
Development of monitoring and follow-up	+	+	+	+	+	+	+	+
Decision						+		+
Monitoring and follow-up	+	+		+	+	+	+	+

71 André et al. at 290. (Translated into English by the authors themselves.)

Annex 1: Impacts identified with the Leopold matrix

Milieux touchés par les impacts									Éléments de l'environnement		
Humain			Biophysique								
Circulation	Voisinage	Employés	État de salubrité	Faune	Flore	Sol	Eau	Air			
Pas d'itinéraire									Sans objet	Aménagements	Activité par phase de projet
										Construction	
x		x				x		x	Amené et fixation des machines		
x	x	x		X		x			Foration dans la roche		
		x		X	x	x		x	Dynamitage de la roche		
x	x	x							Roulage des blocs de roches		
	x	x					x	x	Concassage et arrosage des blocs de roches		
	x	x					x	x	Criblage des roches concassées		
x	x	x						x	Transport/ utilisation du granite		
x	x	x				x		x	Démantèlement	Fin de projet	
	x	x							Rétrocession		
	x	x							Abandon en l'état		

Source: JAT Consulting: 'Projet de concassage de granite à Timbou dans la préfecture de Cinkassé (Nord-Togo)'. [Reconstructed as the original by the authors.]

Annex 2 : Impacts identified with the Leopold matrix

PROJETS D'AMENAGEMENT D'ESPACES NATURELS							
Gestion de l'espace aménagé	Aménagement	Délimitation	PRINCIPAUX CRITERES D'EVALUATION DES INCIDENCES		ELEMENTS CONSTITUTIFS DU MILIEU		
C	B	A					
	×		1	Émission de gaz à effet de serre ou qui appauvrissent la couche d'ozone	CLIMAT ET COUCHE D'OZONE	AIR	BIOPHYSIQUE
×	×		2	Aptitude du site à disperser les polluants	ATMOSPHERE		
×	×		3	Qualité de l'air			
	×		4	Débit annuel moyen du milieu récepteur	EAUX DE SURFACE	EAUX	
×	×			Qualité de l'eau			
×	×		5	Caractéristiques des aquifères	EAUX SOUTERRAINES		
	×			Qualité des eaux			
×	×		6	Sensibilité à l'érosion	SOL	SOLS	
×	×		7	Qualité et usage du sol			
			8	Stabilité	SOUS SOL		
×	×		9	Flore	AQUATIQUES TERRESTRES SOUTERRAINS	BIOTOPES	
×	×			Faune			
×	×			Aires protégées et aires spéciales			
×	×	×	10	Gestion rationnelle	RESSOURCES NATURELLES		
×		×	11	Conflits	ASPECTS SOCIO ECONOMIQUES		HUMAIN
×	×	×	12	Économie locale/ emplois			
×	×		13	Sante/ Sécurité			
×	×		14	Bruits	CADRE DE VIE		
			15	Odeurs			
×	×		16	Qualité paysagère			
×	×	×	17	Patrimoines cultures et archéologiques	PATRIMOINE ET INFRASTRUCTURES		
		×	18	Biens matériels et immobiliers			
×	×		19	Équipements et infrastructures publics			

Source: Rainbow Environment Consult: 'Guide de réalisation et d'évaluation des études d'impact environnemental au Cameroun'. [Reconstructed as the original by the authors.]

Chapter 16

Policy and legal recommendations to tackling the challenges and seizing the opportunities of artificial intelligence in Africa

16.1 Introduction

As indicated in chapter 1, this book set out to recommend approaches to law and policy formulation that will help Africa to overcome the challenges and harness the benefits of artificial intelligence (AI) towards development of the continent. Consequently, preceding chapters examined whether such legal and policy frameworks already exist in Africa; identified the challenges and opportunities of AI in key areas, especially to law and policy, in Africa; and considered the contextual characteristics that would result in, or necessitate, unique regulatory frameworks. This chapter discusses and summarises the findings of these preceding chapters and recommends possible policy considerations for AI regulation in Africa.

16.2 Legal and policy initiatives for artificial intelligence in Africa

There is currently no common national or regional regulatory framework for AI in Africa. However, there are several legal and policy initiatives by national and regional governmental fora aimed at developing regulatory frameworks for tackling the challenges and taking advantage of the opportunities that AI portends for the continent.

At the national level, countries are increasingly establishing specialised AI centres, agencies, or institutions; and developing AI policies and strategies. For instance, plans have been underway since 2022 for the development of a specific AI policy in Nigeria.[1] Prior to this, the Nigerian National Information Technology Development Agency (NITDA)[2] established the National Centre for AI and Robotics (NCAIR) in 2020 to 'promote research and development on emerging technologies', including AI, and to ensure the practical application of the technologies in line with the National Digital Economy Policy and Strategy 2020–2023 (NDEPS).[3] The NDEPS aims, among others, to adopt a developmental regulatory approach that will 'create a dynamic regulatory environment that fosters, rather than hinders, the development'[4] of the Nigerian digital economy.

1 OECD: 'Artificial intelligence'.
2 NITDA is established under the Nigerian National Information Technology Development Agency Act 2007.
3 NCAIR: 'About us'.
4 Federal Ministry of Communications and Digital Economy: 'National Digital Economy Policy and Strategy (2020–2030): Towards a Digital Nigeria' at 22.

Similarly, in 2020, Rwanda created the Centre for the Fourth Industrial Revolution (C4IR Rwanda) in conjunction with the World Economic Forum (WEF). C4IR Rwanda is tasked to work with stakeholders to develop new regulatory approaches, in line with Rwanda's national development priorities, for the governance of emerging technologies and the business models enabled by the technologies. In this regard, AI, machine learning and data governance form the key focus of C4IR Rwanda.[5] Collaboration among C4IR Rwanda, the Ministry of ICT and Innovation, and international partners led to the adoption of Rwanda's National AI Policy in April 2023.[6] Among others, the policy will serve as a pathway for Rwanda to harness the benefits, while mitigating the risks, of AI towards achieving the country's national development plans and promoting sustainable and economic growth. The policy will also create a roadmap for galvanising local, regional, and international partners towards positioning Rwanda Africa's leading innovation hub and centre of excellence in AI.[7] To this end, the policy document contains strategies for Rwanda to: (1) create a workforce with high contemporary AI skills and literary; (2) provide access to affordable, reliable, and secure scalable storage and high-performance compute capability/infrastructure; (3) ensure increased availability and access to quality data for training AI models; (4) build policy and regulatory capacity aligned with emerging global standards and policy/regulation best practices; (5) robustly invest in targeted AI projects that will create social and economic impact, new growth opportunities for private sector and catalyse investment into AI; and (6) provide widely diffused and operationalised guidelines on the ethical development and implementation of AI.[8]

In South Africa, the Centre for AI Research (CAIR) was established in 2011 with funding from the South African government. CAIR is a network of universities and other research groups, and is coordinated by the Centre for Scientific and Industrial Research (CSIR) in South Africa. CAIR's core objectives include to 'develop a world class research capability in South Africa' in the field of AI; and 'support sustainable and effective socio-economic development' in South Africa through consolidated and applied AI research initiatives.[9] At the policy level, South Africa is seeking to harness the opportunities of the 4IR, which includes emerging technologies such as AI, towards achieving the core objectives of poverty eradication and reduction of unemployment and inequality as set out in its National Development Plan 2030.[10] To this end, it set up the Presidential Commission on 4IR (PC4IR) in 2019 which was tasked with the responsibility to develop an integrated national strategy and plan to respond to the 4IR.[11] The PC4IR report was published in 2020.[12] Gleaned from the report, the development of an 'innovation pipeline (ideation to commercialisation)'[13] is recognised as a pathway to harnessing the benefit of the 4IR towards national development. The need to address policy and regulatory challenges in areas are identified as instrumental to developing such an innovation pipeline in South Africa.

5 C4IR Rwanda: 'C4IR Rwanda'.
6 Republic of Rwanda: 'The National AI Policy'.
7 Ibid. at 1.
8 Ibid. at 7–18.
9 CAIR: 'Structure and history'.
10 National Planning Commission: 'National Development Plan 2030: Our Future – Make it Work'.
11 Department of Telecommunications and Postal Services: Notice 209 of 2019.
12 Presidential Commission: Fourth Industrial Revolution Report.
13 Ibid. at 37.

In North Africa, the Egyptian government approved the formation of the National Council on AI (NCAI),[14] which went on to prepare the National AI Strategy that was adopted in 2021.[15] Egypt's National AI Strategy was adopted to 'exploit AI technologies to support the achievement of Egypt's sustainable development goals, to the benefit of all Egyptians';[16] and 'play a key role in facilitating regional cooperation within the African and Arab regions and establish Egypt as an active international player in AI.'[17] The strategy hinged on four pillars (AI for Government, AI for Development, Capacity Building, and International Activities) to be enabled, among others, by a governance framework which will include 'ethics, laws and regulations, tracking and monitoring'.[18] In this regard, the Ministry of Communications and Information Technology (MCIT) launched the Egyptian Charter on Responsible AI in April 2023.[19] The Charter drew from existing international principles, such as those established by UNESCO and OECD (discussed in previous chapters), and situated and adapted the principles within the local context in Egypt.[20] The principles will serve as guidelines and 'actionable insights to help ensure the responsible development, deployment, management, and use of AI systems' in Egypt.[21] To this end, the Charter, which would be reviewed annually, will operate in Egypt as 'soft launch' to empower citizens to expect and demand the best from the use of AI and for all stakeholders to be aware of ethical considerations related to AI and incorporate those considerations into their AI adoption plans.[22] The Charter will also 'signal Egypt's readiness to follow responsible AI practices, something many investors as well as AI ranking bodies look to measure a country's readiness for AI investment and adoption' and 'help to communicate Egypt's needs and priorities to foreign AI developers looking to develop or market their products in the country'.[23] The Charter contains general and implementation guidelines that are formulated to ultimately instil the values of human-centeredness, transparency and explainability, fairness, accountability, and security and safety in the development, deployment, management, and use of AI technology in Egypt.[24]

In Francophone Africa, the Republic of the Congo is hosting the African Research Centre on AI (ARCAI) established through support from the United Nations Economic Commission for Africa (UNECA).[25] ARCAI is created with the objective to bridge the digital divide, promote job creation, provide technology education and skills, enhance inclusive economic growth, and ensure Africa's ownership of modern digital tools.

The AU, through its adoption of the African Digital Transformation Strategy in February 2020,[26] recognised and acknowledged the significance of harnessing the benefits of emerging technologies including AI for the development of the continent's digital

14 See MCIT: 'Artificial_Intelligence'.
15 National Council for Artificial Intelligence: 'Egypt National Artificial Intelligence Strategy'.
16 Ibid. at 5.
17 Ibid.
18 Ibid. at 6.
19 MCIT: 'Egyptian Charter for Responsible AI Launched'.
20 National Council for Artificial Intelligence: 'Egyptian Charter for Responsible AI' at 1.
21 Ibid. at 1.
22 Ibid. at 2.
23 Ibid.
24 Ibid. at 2–5.
25 UNECA: 'Africa's first AI research centre launched in Brazzaville, Congo'.
26 AU: 'The Digital Transformation Strategy for Africa (2020–2030)'.

economy. The AU further acknowledged the important role that up-to-date, flexible, incentive-based and market-driven policies, and legal frameworks would play in addressing the new regulatory frontiers created by the development of AI and other emerging technologies and establishing the foundation upon which Africa's digital transformation can fully evolve.[27] Given the prominent role of intellectual property (IP) protection in the context of AI development and deployment, it is also important to note that the AU Assembly adopted the Protocol on Intellectual Property Rights to the Agreement Establishing the African Continental Free Trade Area 2018 (IP Protocol) in February 2023.[28] The overarching goals are harmonising 'rules and principles on the promotion, protection, cooperation, and enforcement of [IP] rights' towards support for 'intra-Africa trade' and the promotion of 'African innovation and creativity' and deepening of '[IP] culture in Africa', among others.[29] The promotion of 'digital trade along with new and emerging technologies to foster Africa's digital transformation' is recognised as a key guiding principle for achieving the objectives of the IP Protocol.[30] Accordingly, state parties are obliged to

(a) adopt measures to protect emerging technologies through existing categories of intellectual property rights or *sui generis* systems to facilitate trade under the AfCFTA;

(b) adopt measures to promote access and use of new and emerging technologies;

(c) support and encourage the use of emerging technologies to facilitate industrialisation and the development of value chains; and

(d) promote environmentally friendly use of emerging technologies.[31]

In addition to the foregoing regional initiatives, the African Commission on Human and Peoples' Rights (African Commission) adopted a resolution in 2021 by which it called for a study on AI and human and peoples' rights in Africa.[32] This was followed by the AU Development Agency (AUDA-NEPAD), through its High-Level Panel on Emerging Technologies (APET), which concluded a study in 2021 and released a report on AI for Africa: Artificial Intelligence for Africa's Socio-economic Development.[33] The report identified healthcare, mining, energy, agriculture, and financial and public services, as the key sectors in which the deployment of AI technology, supported by the appropriate and progressive legal, policy and ethical frameworks, can significantly contribute to the economic growth and development of Africa.[34] Following the report, APET convened an expert consultative meeting in 2022 for the development of a continental AI strategy in Africa.[35] Among others, the envisaged strategy would aid African countries to comprehensively develop AI-related technology products and services within various

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27 Ibid. at 7.

28 Ncube CB *Intellectual Property Law in Africa: Harmonising Administration and Policy* at 219–220.

29 IP Protocol Art. 2.

30 Art. 4.

31 Art. 17.

32 ACHPR: 'Resolution on the Need to Undertake a Study on Human and Peoples' Rights and Artificial Intelligence (AI), Robotics and Other New and Emerging Technologies in Africa'.

33 AUDA-NEPAD: 'AI for Africa: Artificial Intelligence for Africa's Socio-economic Development'.

34 Ibid. at 1.

35 AUDA-NEPAD 'The African Union Artificial Intelligence Continental Strategy for Africa'.

economic sectors and also model how African countries could improve data security and safeguard AI technology through enabling regulatory frameworks.[36]

16.3 Challenges and opportunities of artificial intelligence in Africa

The previous chapters examine the overarching issues highlighted at section 16.1 above within the context of gender equality and empowerment, human rights, data governance, democracy, digital credit and e-commerce, intellectual property, indigenous knowledge, agriculture, energy and mining, environmental impact assessment, health systems and technologies, labour and employment relations, and legal ethics, process and business. The specific recommendations drawn from the chapters are discussed at section 16.4 below.

While chapter 1 introduces the general research context, objectives and overarching questions of the book, chapter 2 critically analyses South Africa's PC4IR through the lens of race and gender, and explore how narratives of 'techno-legal-optimism' and a technoscience approach may be serving as a 'shiny veneer' that clouds analysis of the race and gender impact of the 4IR. The chapter argues that these approaches are overly optimistic and almost wilfully blind to these pitfalls. Specifically, the PC4IR adopted a binary approach to gender and failed to address racial issues in South Africa. As such, the PC4IR failed to appreciate how AI-based technologies and AI policy reinforce the status quo and its hierarchies of race and gender. This means the use of critique-shielding approaches has resulted in an opportunity to challenge existing inequities being lost.

Within the context of human rights, the first challenge to address in conversations around AI is the difficulty of legal definition of AI and situating this within the concept of human rights. Chapter 3 unpacks these issues. Specifically, the impact of AI on human rights is one of the most critical issues defining the 4IR. The use of AI can help advance the realisation of human rights in Africa. Indeed, there are examples of the use of AI technologies and tools in countries such as Nigeria, Rwanda, Cameroon, Kenya, Uganda, South Sudan, and Tanzania to advance the rights to health, high standard of living, food, water, education, children's rights as well as the rights of internally displaced persons, and other civil and political rights such as the rights to freedom of expression. However, while AI may be used as an enabler of some human rights, there are examples of how the use of AI perpetuates technological racism, gender discrimination, identity erasure, algorithmic bias, breach of data privacy, and facilitates committing serious human-rights abuses in Africa. Beyond these challenges, it will also be important to harness the potentials of ideologically-principled activist movements that include feminist and other human-rights approaches, and to initiate a flexible approach to understanding AI's role in advancing human rights or otherwise on the continent.

Chapter 4 explores how law and policy can be tailored to effectively improve the quality of the data that is used for the training and deployment of AI in Africa. Since AI is a data-driven technology, it is important to note the inexorable nexus between the development and deployment of AI and the realisation of the sustainable development goals set out in the AU Agenda 2063, the UN Sustainable Development Agenda, as well as the objectives articulated in the Digital Transformation Strategy in Africa. From a sustainable development perspective, the emergence of new products and business

36 Ibid.

models – including leapfrogging solutions, solutions for bottom of pyramid individuals, and easier access to credit; the automation of core business processes leading to lower product costs; human capital development; and innovation in government services – are the key opportunities that AI offers Africa. However, without appropriate law and policy that fosters competition, interoperability and safety within the data ecosystems, the opportunities offered by AI can be foiled by the risks associated with its deployment. These risks (or challenges) include the obsolescence of a traditional export-led path to economic growth, increase in digital and technological divide, transformation of job requirements and disruption of traditional job functions, and questions around privacy, security, and breach of public trust.

Given the current reality of AI deployment in democratic processes, and against the backdrop that independent oversight is a critical aspect of ensuring the proper use of AI in such processes, chapter 5 examines the potential impact of AI on democracy in Africa. Examples of how electoral processes and individual decision-making have been AI-manipulated in Africa include maintaining public order and security through smart city surveillance, the facilitation of public participation in governance and biometric voter registration. The risks associated with the use of AI in such instances include the lack of an independent oversight mechanism and inadequate technical capacity to install and manage digital technology. These risks are worsened by the fragile state of democracy in many African states. These risks have actualised in some African states' use of AI to suppress their population's freedom of expression and their right of access to information by governmental authorities.

With both optimism and caution, chapter 6 explores the development of AI in digital credit transactions and activities through a gendered lens. There is clearly potential for AI to reduce certain common manifestations of gender bias during financial transactions such as loan applications and credit scoring. However, the reality of current AI implementation is that many of the same traditional biases against women are introduced into AI systems through numerous sources. Even in pre-existing datasets that are engineered to be gender-blind, AI algorithms can still learn gender bias through implied associations between gender and creditworthiness. These challenges are very difficult to eliminate through regulation, particularly where the source of bias may be as fundamental as gender preferences that are built into language, or where the operation of the AI algorithm is not well understood.

As systems to protect creative and inventive outputs, chapter 7 underscores the significance of IP to AI. Essentially, IP has the capacity to contribute to the development of AI, as well as the potential to aid the harnessing of AI technologies for development in Africa. In this regard, conversations around the nexus between AI and IP usually perceive AI from two key perspectives: as legal objects and as legal subjects. As legal objects, AI systems are conceptualised or envisaged as tools with which specific objectives and specific tasks are achieved and undertaken respectively. As legal subjects, AI is perceived as persons acquiring rights to or interests in a legal object (that is to say, IP-protectable material) or engaging in creative endeavours or taking inventive steps. However, the chapter addresses the important question of whether given the development goals and plans set by African countries, IP protection is necessary or desirable to promote or incentivise the development and deployment of AI systems on the continent. As used in the chapter, 'necessity' means granting or proposing the grant of IP rights to protect or secure AI systems and incentivise further and increased development and deployment of AI in Africa. Necessity or desirability takes for granted the need to incentivise the development and deployment of AI in Africa and only considers whether an IP rights framework is needed or desirable to incentivise these works. Accordingly, while the chapter argues that IP protection would be available for AI systems, it implies that the IP system is more than just IP protection. Even so, the IP system embodies other components that may be better placed to harness the opportunities and overcome the challenges of AI on the continent.

In every existing framework for data protection law and regulation, healthcare data is positioned in the most sensitive category of personal data, requiring the highest burden of care for data processors. It is no surprise, then, that the use of AI in the healthcare sector is highly contentious. Accordingly, chapter 8 explores numerous issues that arise when AI is applied in healthcare systems. One example is the universal desire for personalised, human attention in treating patients versus the ability of AI to efficiently analyse data from large numbers of patients and, increasingly, make more accurate diagnoses. Another example is the strong requirement in data-protection frameworks for minimising the collection and use of sensitive personal data versus the need for existing AI systems to access large datasets in order to work effectively. Within the African context, the most significant tension – that between access to data and the efficient construction and use of AI systems – permeates every existing and projected use case in healthcare systems; and this may lead to inequalities, such as inadequate regulation, expertise, datasets, and resources.

Chapter 9 explores questions of ethical, equitable, and effective use of AI within the context of indigenous knowledge (IK). Unique aspects of IK include a tendency toward verbal transmission, a lack of documentation and indexing, and challenging questions of ownership and authorship. These same questions have hindered the application of traditional concepts of IP to IK, and this chapter demonstrates how they equally challenge the application of AI to IK. Nevertheless, areas where AI might have very positive impacts include the preservation of IK in cases where the traditional sources of custodianship are struggling to ensure continuity. In view of such potential benefits, and the inevitability of AI systems encountering IK, the chapter describes policy options that should be fully explored.

Situating the conversation within the colonial history of Africa, and the impact of industrialisation of work, including the role of technological advancement, on the rights of workers, chapter 10 notes that the regulatory systems that govern labour and employment relations were constructed dynamically. As such, the regulatory systems allow for development, new articulations and revisions as the law interacts with technological advancements – including the deployment of AI in the context of work. The deployment of AI technologies can improve efficiency and create a safer workplace, with advanced robotics assisting in and performing work that is hazardous for humans to perform. However, the use of AI in workplaces has associated quantitative and qualitative risks for labour. For example, the quantitative risks manifest in the possibility of large-scale job losses, while the qualitative risk relates to the impact of the use of AI on the conditions and quality of existing and new forms of jobs. Also, the effectiveness of trade unions and the ability to organise workers is constrained by developments in which work is restructured, fragmented, and distributed across value chains, often regional and global in scope. Furthermore, regardless of their status, workers are more likely to find themselves subject to invasive technological monitoring and supervision with an increased risk of bias and discrimination. Such risks can disproportionately impact and burden unskilled or semi-skilled workers. Moreover, the risks associated with the deployment of AI in the context of work, emerged against the backdrop of recent developments that have eroded standard forms of employment.

Such erosion is often accompanied by declining trade-union density and many vulnerable workers remain outside of the net of protection offered by trade unions.

Chapter 11 examines the deployment, development and capabilities of AI within the context of legal process, practice and business in Africa. Drawing from experiences in jurisdictions outside Africa and the emerging application of AI within the African legal practice, process and business environment, the chapter identifies and discusses specific use cases of AI. These use cases include the deployment of AI technology in the review and drafting of legal documents, analysis and framing of commercial contracts, legal research and publishing, digital justice and dispute resolution systems, and the promotion of access to justice. Indeed, through techniques, such as natural language processing (NLP), and predictive algorithm tools, AI technology is able to assist in the making of decisions by lawyers and judges in the legal process, business and practice in Africa. However, the use of AI in this context comes with key challenges that should be addressed by a well-formulated regulation regime. These challenges include questions around the quality, objectivity or bias of the datasets that have been used to train the AI, and the inability of AI technology to promote ethics and transparency in the legal process.

Linked to the foregoing, chapter 12 identifies and examines the challenges and opportunities that AI portends for legal practice in Africa. Focusing on the culture of legal practice in South Africa, Zambia, Kenya, Uganda, Nigeria, Ghana and Egypt, the chapter considers how the rules on legal ethics can be tailored to take advantage of the opportunities and resolve the challenges of AI in Africa. Generally, rules on legal ethics in Africa seek to maintain key cross-cutting values that include the promotion of good moral conduct and high-quality service delivery, and the prevention of professional misconduct in legal practice. The development and appropriate deployment of AI can contribute to the promotion of these ideals. Nonetheless, lawyers lack the competence to (a) master how AI systems work generally; (b) appreciate and prevent the legal and ethical risks associated with the use of AI especially in the area of client privilege and confidentiality; and (c) predict algorithmic decision making.

The mining and energy sectors in Africa have been adapting AI technologies at a fast pace. From electricity grid optimisation, to improved prospecting and autonomous mining machines, the speed and efficiency of AI in decision-making and pattern recognition has clear benefits for the industry. Considering the potentially hazardous nature of mining activities, with both short-term and long-term health and safety risks, the sector's justifications for adopting autonomous machinery are compelling notwithstanding the associated negative impacts on employment. Moreover, AI is potentially useful even at the smallest scales of production, such as by improving traceability of minerals extracted by artisanal and small-scale mining operations. Chapter 13 explores use cases for AI in the mining and energy sectors and discusses international, regional, and national activities in regulating AI in the context of these sectors. There is a strong connection between the use of AI in the energy and mining sector and data protection laws; and this contributes to the challenges (such as the lack of electrification and the reliance on biomass as an energy resource) to the adoption of AI in these sectors.

Similar conclusions are reached in chapter 14 which advocates for alignment between national and continental AI regulatory systems within the context of agriculture in Africa. Specifically, chapter 14 considers how the application of AI to agriculture can best be regulated, given its wide-ranging application, enormous potential and impact. It evaluates such applications to precision agriculture, diagnosis of crop diseases as well as soil and crop management. Subsequently, the chapter considers the AU's regulatory instruments on agriculture, finding them to be well-entrenched and comprehensive. This is followed by an analysis of the AU's regulatory instruments on AI, which are less established than the agricultural framework, consisting only of the Digital Transformation Strategy for Africa (a policy document). While the potential of AI in agriculture is undoubtedly significant, its realisation is blighted by significant challenges to the effective use of AI in Africa. These challenges include inadequate infrastructure, lack of relevant technical knowledge and skills, the lack of quality data, limited access to data, the Digital Divide and IP-related concerns that negatively impact these aspects.

Chapter 15 examines the role of AI in the context of conducting environmental impact assessments (EIA) for natural and human environments, and the role of law in that area. AI tools come with advantages in EIA processes, including increased speed and efficiency. However, newer AI tools (AI 2.0 systems)[37] have the potential to violate human rights and pose threats on environmental protection and the protection of the rights of indigenous peoples and local communities over their natural resources and TK. This is because such systems can perpetuate and indeed magnify stereotypes and biases based on their inability to distinguish true from false or ethical from unethical in the EIA process.

16.4 Recommendations for an effective artificial intelligence regulatory framework in Africa

Generally, there is a knowledge gap and the need for capacity building for law and policy formulators on the specific and diverse ways in which AI technologies impact the different sectors in Africa. All the chapters have explained the unique aspects raised by the application of AI to each of the fields or sectors they considered. Many of these aspects are not yet fully understood and legislators and policy makers need to familiarise themselves with them. Even so, the previous chapters tell a story of increasing awareness of the challenges among African law and policy formulators, as well as Africa's openness, willingness and policy actions aimed at embracing the opportunities and tackling the challenges that AI offers to the continent. This is demonstrated in 1.2 above. In addition, chapters 1 and 2 show the openness and willingness of the continental human rights protection mechanism to understand ways of regulating the development and deployment of AI technologies for effective human-rights protection in Africa. This is demonstrated by the adoption in 2021 of Resolution 437 by the African Commission on Human and People's Rights, which committed to 'to undertake a study in order to further develop guidelines and norms that address issues relating to AI technologies, robotics and other new and emerging technologies and their impact on human rights in Africa working together with an African Group of Experts on AI and new technologies.' Among other things, the resolution also called on

> 'State Parties to ensure that the development and use of AI . . . is compatible with the rights and duties in the African Charter and other regional and international human rights instruments, in order to uphold human dignity, privacy, equality, non-discrimination, inclusion, diversity, safety, fairness, transparency, accountability and economic development as underlying principles that guide the development and use of AI . . .; and

37 The term AI 2.0, as used in ch. 15, refers to the current understanding of AI as defined in ch. 1.

> the [AU] and regional bodies to urgently place on their agendas the rapid issue of AI technologies . . . with a view to develop a regional regulatory framework that ensures that these technologies respond to the needs of the people of the continent.'

The foregoing notwithstanding, the policy and institutional initiatives discussed in 1.2 above may be described as 'piecemeal use of existing legislative and policy frameworks to address the many emerging gaps and challenges as people and entities adopt the use of [AI] technologies in various spheres'.[38] According to Adams et al, this piecemeal approach has resulted in 'difficulties on the part of governments on the African continent to ensure and enforce responsible AI while taking into account their context demands'.[39] Furthermore, overcoming the difficulty of a piecemeal approach to AI regulation would require looking at the global regulatory trend, without losing track of the contextual characteristics of the continent when formulating substantive rules to govern the deployment and development of AI in Africa.

A study of AI regulatory initiatives in eight jurisdictions[40] evinces five key approaches.[41] Three of the approaches focus on the substantive content of the regulations. Here, the study identified AI regulations that conform with core principles of respect for human rights, transparency, sustainability, and strong risk management as defined in the OECD Recommendations discussed in chapter 10.[42] There are also AI regulations that adopt a risk-based approach[43] in the sense that they focus on the perceived risks of AI to core values such as security, privacy, transparency, and non-discrimination.[44] Finally, the study identified systems that adopt regulatory sandboxes,[45] which 'refer to regulatory tools allowing businesses to test and experiment with new and innovative products, services or businesses under supervision of a regulator for a limited period of time.'[46] Regulatory sandboxes foster business and regulatory earnings. However, the use of regulatory sandboxes may lead to the prioritisation of commercial interest and the lowering of safeguards necessary to protect consumers and public.[47] Interestingly, the US recently introduced the use of executive orders as an AI regulatory tool. On 30 October 2023, President Joe Biden signed an executive order on the safe, secure and trustworthy development and use of AI in America.[48] The executive order recognised the advantages and risks associated with the development and use of AI technologies; and the urgent need to harness the benefits while ensuring responsible AI by safeguarding against the risks which AI portends for human rights, privacy, job security, among others, in the different sector of the American society. The use of executive

38 Adams R et al. 'A new research agenda for African generative AI'.
39 Ibid.
40 USA, EU, Canada, Korea, Singapore, UK, Japan, and China.
41 EY Global: 'The Artificial Intelligence (AI) global regulatory landscape: Policy trends and considerations to build confidence in AI'.
42 Ibid. at 7–8.
43 Ibid. at 8–9.
44 For a discussion of the risk-based approach to AI regulation, see Schuett J 'Defining the scope of AI regulation' at 60–82.
45 EY Global: 'The Artificial Intelligence (AI) global regulatory landscape' at 10.
46 European Parliament Research Service: 'Artificial intelligence act and regulatory sandboxes'.
47 Ibid. at 2–3.
48 The White House: 'Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence'.

orders as a regulatory tool was not captured in the above study. According to Okebukola and Kana,[49] an executive order can be regarded as

> 'a command directly given by the president to an executive agency, class of persons or body under the executive arm of government. Such a command is in furtherance of government policy or Act of the Legislature. The executive order may require the implementation of an action, set out parameters for carrying out specific duties, define the scope of existing legislation or be a subsidiary instrument.'[50]

The other two key approaches drawn from the study of AI regulatory initiatives focus on the scope or coverage of the regulatory frameworks. Here, the study identified AI regulations that adopt a sectoral approach based on the various aspects of society impacted by AI;[51] and those that take a general approach and situate AI regulations within the broad digital policy priorities such as human rights, data privacy, cyber security, and IP.[52]

While the three key approaches on substantive content identified in the above-mentioned study may offer useful guidance, African law and policy makers would have to decide which path to take between adopting a generalised or broad-based approach or a sectoral approach to AI regulation. Whatever the approach adopted, national and regional AI legal and policy initiatives must be rooted in regulatory frameworks that are home-grown and responsive to the peculiar needs of the African continent in order to effectively harness the benefits of AI, while addressing its challenges. Such regulatory frameworks must be flexible and balanced to allow room for development of AI technology in Africa; must be developed through an open, consultative, and transparent process; and must be framed and tailored with cautious optimism to suit the lived experiences of Africans, address the challenges faced by Africans, and achieve the developmental priorities of the continent as articulated in the AU Agenda 2063.[53] Put differently, an AI regulation framework from Africa must be people centred, promote ethical and responsible use of AI, and ensure the sustainable development of Africa.

Gleaned from the previous chapters, a generalised or broad-based approach to AI regulation in Africa, to be effective, should be formulated to address key overarching and cross-cutting issues such as

(a) biases, including gender, ethnic and race biases, in the development and deployment of AI;

(b) data privacy and data protection, especially in relation to sensitive data such as health, IK, and finance;

(c) ensuring a human-centred approach to AI development and deployment law, and a human-rights approach to AI-related law and policy making;

(d) striving for balance between protection, access to, and use of AI technology. In this regard, rules that promote access to and use of AI technologies should be given pre-eminence in view of the enormous accessibility needs in relation to the

49 EO Okebukola and AA Kana 'Executive orders in Nigeria as valid legislative instruments and administrative tools' at 59–68.

50 Okebukola and Kana at 61. See also CI Okorie 'Government role in realising a "right" to research in Africa'.

51 EY Global: 'The Artificial Intelligence (AI) global regulatory landscape' at 9–10.

52 Ibid. at 10.

53 AU: 'Agenda 2063: The Africa we Want in 2063'.

important datasets required for the development of AI technology in Africa as demonstrated in chapters 4 and 7; and

(e) ensuring that a pro-development and public interest approach to AI development and deployment is adopted by key investors and regulators in the field of AI.

The foregoing being said, the following specific recommendations drawn from the previous chapters are important considerations that can inform the formulation of substantive contents of a regulation framework whether a generalised or sectoral regulatory approach is adopted.

- To foster gender equality through the use of AI, chapter 2 underscores the importance of adopting a more critical approach to AI regulation, which will enable pathways forward for dismantling relations of power to emerge. An acknowledgment of the primacy of gender as a core factor that is multidimensional and intersectional,[54] will lead to a less blinkered and more realistic vision of the 4IR which would result in the appropriate governance of AI-based technologies. In this connection, and to ensure financial inclusion in the use of AI technologies in digital consumer credit in Africa, chapter 6 admonishes law and policy formulators to adopt measures for reducing bias. These measures include adopting a feminist approach when designing AI systems; promoting transparency in the development, use, assessment, and monitoring of AI; rigorously applying data-protection safeguards; using multi-disciplinary collaboration to create best-practice standards; empowering consumers; promoting gender-equity in AI skills and capacity; and generally promoting financial and digital literacy. A sustained effort across these themes would reduce gender biases in AI systems, and would generally result in more effective and efficient financial transactions.
- Within the broader context of human-rights protection as examined in chapter 3, harnessing the benefits and addressing the challenges of AI in Africa would require the development and deployment of AI in line with these values and ideals enshrined in the existing international and national human rights regimes, and the structuring of AI systems in accordance with standards of algorithmic accountability, data protection, explainability of decision-making, and, in particular, in compliance with the norms of the African Charter on Human and Peoples Rights.
- Concerning data governance, the availability, interoperability, as well as integrity and security of data are the three key areas that can ensure data quality for the use of AI towards sustainable development in Africa. Unfortunately, as chapter 4 shows, existing national and regional data legal regimes cannot effectively support and promote data availability, interoperability, and integrity and security for AI development and deployment to achieve sustainable development on the African continent. Therefore, a crucial intervention at the present moment will be to strive towards harmonising regulatory initiatives at the national levels with regional AI strategies in order to avail data for the development and use of AI systems for AI-driven sustainable development in Africa.
- As noted in chapter 5, AI is not a natural ally of democracy in the sense that it does not necessarily enhance democracy. Yet, to counter potentially anti-democratic

54 For further insights, see Chabikwa R 'AI, gender, and development in Africa: feminist policy consideration'; Mudongo O 'Navigating the Intersection of AI, Data Protection, and Gender in Africa: A Feminist Approach'.

tendencies of AI technologies, chapter 5 shows that it is important to create an international system of standards and ethics, based on international human rights law, with an oversight body established as part of the United Nations Human Rights Special Mechanisms, such as a United Nations Special Rapporteur on the development and deployment of AI or an African Charter Special Rapporteur or a Working Group. It is also important for the democracy deficit in Africa to be addressed so that AI is deployed in a more stable political setting.

- It is suggested, as gleaned from chapter 7, that IP legal frameworks play a key role when it comes to harnessing the opportunities and addressing the challenges of AI in Africa. Going forward, it will thus be crucial to appreciate that the context of the continent requires not only robust IP protections for enabling AI development, but also an IP system that sufficiently and flexibly caters for data access and use, data curation and disclosures. For the latter, and as stated in chapter 7, 'delineating and maintaining the scope of and approach to IP protection as well as actualising limitations and exceptions can help African countries to better utilise AI and meet their development goals.'
- To resolve the tensions between data protection and the much-needed efficient development and deployment of AI systems within the health system in Africa as demonstrated in chapter 8, AI regulation in the healthcare sector must be proactive rather than reactive, in order for AI to realise its potential without causing serious harm to patients and health systems. Essentially, and as gleaned from chapter 8, AI regulation for the health sector must be clear about the parameters of engagement and how far it is willing to concede, as well as why said concessions are being made. For instance, the protection of human rights against potential abuse in the use of AI technologies must trump any fears of calcification which often prompt the legislator to be lax in the extent to which it will regulate in the bid to enable and encourage innovation; and innovation in the field of medicine must be regulated to serve humanity.
- In the context of IK, there is a need for, as chapter 9 makes a strong case for, collaboration between government and IK stakeholders to carefully formulate and enforce regulatory regimes that promote equitable interactions of AI and IK. Such efforts must be aimed at ensuring AI incorporates IK in an ethical and inclusive manner to contribute to growth and development. The preservation of IK using AI technologies would ensure that IK is not only available to future generations but for utilisation in activities to meet the social and economic development goals. However, given the potential of exploitation of indigenous communities by external parties, as demonstrated by chapter 9, it is important that the AI regulations offer sufficient guardrails to protect local communities. As chapter 9 shows, current IP and data protection laws are insufficient to deal with the complexities surrounding AI, IK and the issues that arise when they intersect. Therefore, new policies are required. These new policies should centre the needs and priorities of indigenous communities; enshrine control of IK data into the hands of indigenous communities; establish protocols for these communities to offer input and oversight in the development of AI technologies; and establish compensation policies for indigenous communities where their knowledge is utilised for production of commercial goods or services.
- The current and future benefits and challenges of AI in the area of labour law and employment relations in Africa are enormous, as demonstrated in chapter 10. Therefore, the law and policy interventions for the regulation of AI in this field must

be balanced in order to mobilise the benefits that flow from the automation of work and work processes, while also managing the severe risks associated with the deployment of AI. Drawing from the five complementary principles of the OECD Recommendations on AI, which seek to foster innovation and trust in AI, while ensuring respect for human rights and democratic values, a human-centred approach to the regulation of AI within the context of work in Africa is imperative. The OECD principles provide a useful measure for appraising the effectiveness of labour law as an instrument that promotes and enforces fundamental labour standards, balances competing interests in the workplace and in labour market, and, ultimately, humanises work within an AI-driven digital age.

- As discussed in chapters 11 and 12, AI finds relevance and comes with challenges in the legal business, practice and processes; and for addressing ethical issues within the legal profession in Africa. However, there is a competence gap among enforcers of ethical rules within the legal profession that can hamper effective use of AI for the promotion of cross-cutting values required for ethical legal practice in Africa. There is, thus, an urgent need for reform of the regulatory architecture of legal ethics in order to position the legal profession to enjoy the benefit of AI and address its challenges within the context of legal practice in Africa. Furthermore, with a regulatory approach that incorporates incremental and informed step-by-step development, which is slowly scaled and monitored to ensure reliability and efficiency, Africa-based innovators can develop and market powerful AI solutions that can boost the work of legal professionals (lawyers and judges) and begin to address the access to the justice gap on the continent.
- To address the challenges and take advantage of the benefits of AI in the energy, mining and agricultural sector in Africa, chapters 13 and 14 recommends that African governments should do the work of tailoring AI-focused laws and regulations to match African needs and realities in these key sectors (as in other sectors), rather than adopting European or other models. Accordingly, as chapter 13 shows, Africa's mining is characterised by widespread presence of artisanal and small-scale mining (ASM) and the use of rudimentary methods. Consequently, regulation in the mining sector in Africa must provide frameworks for addressing the technological challenges in ASM in order to effectively benefit from AI. Similarly, Africa's energy sector is characterised by, among others, heavy reliance on traditional energy such as firewood for cooking and candles for lighting. There is, therefore, an urgent need for regulation to ensure and promote modern energy access in Africa for AI to be effective in the energy sector. Furthermore, while the AU's agricultural policy framework is sound, chapter 14 notes that there is a sharp disconnect and disparity between it and the domestic laws of its member states. To reconcile this disparity, the AU should embark on a consolidation program to foster coordination and monitor implementation; and work towards creating a regulatory system for AI which is grounded in Africa's complex social, economic, energy, environmental, historical, legal, political, and technological contexts and realities in order to address the challenges of AI.
- To address the effect of the use of AI technology on human rights and indigenous peoples and local communities in EIA processes in Africa, chapter 15 recommends that regulation frameworks must be tailored from both *ex-ante* and *ex-post* perspectives. *Ex-ante*, the law should seek to prevent the replication of biases and incorporate precautionary principles. In this regard, when creating new regulations for AI developers, existing environmental regulations concerning Indigenous Peoples and

Local Communities' free, prior, and informed consent could be leveraged for the ethical use of AI in environmental and social impact assessment. *Ex-post*, clear liabilities rules should exist to deal with damages resulting from the use of AI tools and poor prediction of environmental and social impacts.

16.5 References

ACHPR: 'Resolution on the Need to Undertake a Study on Human and Peoples' Rights and Artificial Intelligence (AI), Robotics and Other New and Emerging Technologies in Africa' ACHPR/Res. 473 (EXT.OS/ XXXI) 25 February 2021 <https://www.achpr.org/sessions/resolutions?id=504> (accessed 18 September 2023).

Adams R, Alayande A, Brey Z and Browning B 'A new research agenda for African generative AI' (2023) *Nature Human Behaviour* <https://www.nature.com/articles/s41562-023-01735-1> (accessed 12 October 2023).

AU: 'Agenda 2063: 'Agenda 2063: The Africa we Want' (September 2015) <https://au.int/sites/default/files/documents/36204-doc-agenda2063_popular_version_en.pdf> (accessed 18 September 2023).

AU: 'The Digital Transformation Strategy for Africa (2020-2030)' <https://au.int/sites/default/files/documents/38507-doc-dts-english.pdf> (accessed 3 February 2023).

AUDA-NEPAD 'The African Union Artificial Intelligence Continental Strategy for Africa' (23 May 2022) <https://www.nepad.org/news/african-union-artificial-intelligence-continental-strategy-africa> (accessed 18 September 2023).

AUDA-NEPAD: 'AI for Africa: Artificial Intelligence for Africa's Socio-economic Development' (August 2021) <https://www.nepad.org/publication/ai-africa-artificial-intelligence-africas-socio-economic-development> (accessed 18 September 2023).

C4IR Rwanda: 'V4IR Rwanda' <https://c4ir.rw/> (accessed 18 September 2023).

CAIR: 'Structure and history' <https://cair.org.za/about> (accessed 18 September 2023).

Chabikwa R 'AI, gender, and development in Africa: feminist policy consideration' (2023) <https://www.oii.ox.ac.uk/wp-content/uploads/2023/03/AI_-GENDER_-DEVELOPMENT-IN-AFRICA_V01-1.pdf> (accessed 15 October 2023).

Department of Telecommunications and Postal Services: Notice 209 of 2019 *GG* No. 42388 of 9 April 2019 <https://www.gov.za/sites/default/files/gcis_document/201904/42388gen 209.pdf> (accessed 18 September 2023).

European Parliament Research Service: 'Artificial intelligence act and regulatory sandboxes' (June 2022) <https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733544/EPRS_BRI (2022)733544_EN.pdf> (accessed October 2023).

EY Global: 'The Artificial Intelligence (AI) global regulatory landscape: Policy trends and considerations to build confidence in AI' (September 2023) <https://www.ey.com/en_no/ai/how-to-navigate-global-trends-in-artificial-intelligence-regulation> (accessed 15 October 2023).

Federal Ministry of Communications and Digital Economy: 'National Digital Economy Policy and Strategy (2020–2030): Towards a Digital Nigeria' <https://www.ncc.gov.ng/docman-main/industry-statistics/policies-reports/883-national-digital-economy-policy-and-strategy/file> (accessed 18 September 2023).

MCIT: 'Artificial Intelligence' <https://mcit.gov.eg/en/Artificial_Intelligence> (accessed 18 September 2023).

MCIT: 'Egyptian Charter for Responsible AI Launched' (20 April 2023) <https://mcit.gov.eg/en/Media_Center/Press_Room/Press_Releases/66939#:~:text=The%20Egyptian%20Charter%20for%20Responsible,Accountability%2C%20and%20Security%20and%20Safety> (accessed 12 October 2023).

Mudongo O 'Navigating the Intersection of AI, Data Protection, and Gender in Africa: A Feminist Approach' (2023) <https://cipit.strathmore.edu/navigating-the-intersection-of-ai-data-protection-and-gender-in-africa-a-feminist-approach/> (accessed 15 October 2023).

National Council for Artificial Intelligence: 'Egypt National Artificial Intelligence Strategy' <https://mcit.gov.eg/Upcont/Documents/Publications_672021000_Egypt-National-AI-Strategy-English.pdf> (accessed 18 September 2023).

National Council for Artificial Intelligence: 'Egyptian Charter for Responsible AI' (2023) <https://aicm.ai.gov.eg/en/Resources/EgyptianCharterForResponsibleAIEnglish-v1.0.pdf> (accessed 12 October 2023).

National Planning Commission: 'National Development Plan 2030: Our Future – Make it Work' <https://www.gov.za/sites/default/files/gcis_document/201409/ndp-2030-our-future-make-it-workr.pdf> (accessed 18 September 2023).

NCAIR: 'About us' <https://ncair.nitda.gov.ng/?page_id=2584> (accessed 18 September 2023).

Ncube CB *Intellectual Property Law in Africa: Harmonising Administration and Policy* (Oxon: Routledge, 2023).

OECD: 'Artificial intelligence' <https://oecd.ai/en/dashboards/policy-initiatives/http:%2F%2Faipo.oecd.org%2F2021-data-policyInitiatives-27396> (accessed 18 September 2023).

Okebukola EO and Kana AA 'Executive orders in Nigeria as valid legislative instruments and administrative tools' *Nnamdi Azikiwe University Journal of International Law and Jurisprudence* 3 (2012) 59–68.

Okorie CI 'Government role in realising a "right" to research in Africa' (2023) PIJIP/TLS Research Paper Series No.96 <https://digitalcommons.wcl.american.edu/research/96/> (accessed 31 October 2023).

Presidential Commission: 'Fourth Industrial Revolution Report' (January 2020) *GG* No. 43834 of 23 October 2020 <https://www.gov.za/sites/default/files/gcis_document/202010/ 43834gen591.pdf> (accessed 18 September 2023).

Republic of Rwanda: 'The National AI Policy' (20 April 2023) <https://www.minict.gov.rw /index.php?eID=dumpFile&t=f&f=67550&token=6195a53203e197efa47592f40ff4aaf24579640e> (accessed 12 October 2023).

Schuett J 'Defining the scope of AI regulation' *Law, Innovation and technology* 15(1) (2023) 60–82.

UNECA: 'Africa's first AI research centre launched in Brazzaville, Congo' (9 March 2022) <https://www.un.org/africarenewal/magazine/march-2022/africas-first-ai-research-centre-launched-brazzaville-congo> (accessed 18 September 2023).

The White House: 'Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence' (30 October 2023) <https://www.whitehouse.gov/briefing-room/presidential-actions/2023/10/30/executive-order-on-the-safe-secure-and-trustworthy-development-and-use-of-artificial-intelligence/?s=08> (accessed 31 October 2023).

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