THE DEVELOPMENT AND GROWTH OF AI IN UGANDA: HOW IS UGANDA FARING FROM A LEGAL PERSPECTIVE?

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ABSTRACT

This paper examines the development and growth of Artificial Intelligence (AI) in Uganda by highlighting how Uganda is faring from a legal perspective. AI as a branch of computer science, aims to create machines that mimic human intelligence. It involves the development of computer systems that can perform tasks that often require human intelligence, such as visual perception, speech recognition, decision-making, language interpretation,[1] and simulation of human abilities.[2] It has been argued that Uganda's legal and regulatory environment for AI is undeveloped and still evolving to address the progressing aspects of AI. While Uganda does not have an all-inclusive legal framework specifically enacted for AI, it should be noted that many laws and regulations are already in place from which we can make inferences applicable to a few aspects of AI, such as the need for data and privacy protection, cyber security and protection of intellectual property, as can be garnered from some of the existing Ugandan relevant statutes.[3] One of the findings of this paper, however, affirms that Uganda lacks specific laws that address AI ethics, liability, and accountability. This deficit in the legal framework of Uganda poses challenges, specifically about the ethical application of AI and the protection of human rights. The paper concludes with the recommendation that strengthening the legal and regulatory framework is vital to ensuring that AI is developed and used responsibly through the enactment of specific AI laws that will address the concerns of ethics, liability, and governance.

Keywords: Artificial Intelligence, personal data, privacy, data protection, cyber security.

1. Introduction

Artificial Intelligence (AI) has been rapidly developing with transformative influence in numerous areas of human activity globally to which Uganda is not an exception. In that, Uganda's attempts to encompass AI in its day-to-day activities are influenced by its distinctive socio-economic

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[1] Oxfords Dictionary, <https://www.google.com/search?client=firefox-b-&q=definition+of+artificial+intelligence>, accessed 12 August 2024.

[2] <https://www.ibm.com/topics/artificial-intelligence>, accessed 12 August 2024.

[3] The Copyright Act 2006, Electronic Transactions Act, 2011, the Computer Misuse Act, 2011, the Industrial Property Act 2014, Data Protection, Privacy Act, 2019, and the Data Protection and Privacy Regulations, 2021.

context, governance structures, and technological infrastructure. The journey of Uganda's transition into the AI landscape is quite promising. It is characterized by both public and private sector initiatives. The government's Vision 2040 highlights the significance of Science, Technology, and Innovation (STI) as drivers of socio-economic revolution, with AI being acknowledged as a precarious element of this vision[4]. Uganda currently has no laws or regulations regulating big data, machine learning, and legal implications of AI Technology Applications. Although AI is new, Uganda has no laws or legal cases regarding the legal implications of AI, as it is rapidly developing. Uganda has recently begun considering the idea of creating a law to regulate the country's AI research and investment. This was clarified by the Uganda National Council for Science and Technology, which published the National Framework for Research and Innovation in Uganda. This fundamental change in the understanding and use of AI raises an interesting question: not only how will Ugandan AI products be managed and protected, but also how will AI issues be regulated under the law.[5] The first part of this study, therefore, offers some insight into the concept of AI and its development in Uganda, while the second part examines the Ugandan Legal Framework on AI, followed by a detailed analysis of the trends and extent of AI technology application in Uganda. The last two parts of the study extensively analyze the issues and challenges hindering the development of AI, as well as the prospects of AI in Uganda from a legal and policy perspective.

1.1 Concept of AI

Artificial intelligence (AI) is defined as the theory and development of computer systems that can perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation.[6] AI is the technology that enables computers and machines to do this. It is about imitating human intelligence and having the ability to solve problems.[7] Broadly speaking, AI is a branch of computer science that aims to create robotic machines that mimic human intelligence, inspired by the activity of human neurons.

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[4] Uganda, *Vision 2040* (Uganda National Planning Authority 2013).
[5] Otim Enoch, Understanding Artificial Intelligence and Copyright Law in Uganda,
<https://www.linkedin.com/pulse/understanding-artificial-intelligence-copyright-law-uganda-enoch--vdgke/>,
accessed 29 July 2024.
[6] Oxfords Dictionary, <https://www.google.com/search?client=firefox-b-&q=definition+of+artificial+intelligence>,
accessed 12 August 2024.
[7] <https://www.ibm.com/topics/artificial-intelligence>, accessed 12 August 2024.

It integrates basic knowledge of hearing and object recognition, and allows machines to perform tasks with the same or higher accuracy than humans. The most widely used AI tools include machine learning, deep learning, natural language processing, fuzzy logic, expert intelligence, robotic machines, logic operations, and many hybrid systems that combine two or more intelligence technologies.[8]

2. Legal and Regulatory Framework on the Application of AI Technology in Uganda

As earlier mentioned, there is no Legal Framework on AI in Uganda, as could be found in other African countries like Nigeria, South Africa, Rwanda, Egypt, and the Republic of Congo.[9] However, the national government has initiated several laws and policies to address the issue of developing regulatory frameworks to tackle the challenges posed by AI technology applications and taking advantage of the opportunities that AI portends for Uganda. However, there are a few other regulations that are relevant to AI in Uganda. These include the Copyright Act 2006,[10] the Computer Misuse Act, 2011, Electronic Transactions Act, 2011, the Industrial Property Act 2014, Data Protection and Privacy Act, 2019,[11] and the Data Protection and Privacy Regulations, 2021. All these are being looked at because of their direct relevance to AI.[12] These Acts and Regulations aim to promote privacy and protection of personal data by regulating the collection, processing, and storage of personal data which are already guaranteed to Ugandans under the Constitution. These Acts and regulations also ensure the protection of privacy in the digital world. It is, therefore, important for companies and others using AI and big data to strictly comply with the Acts before collecting or processing personal data. [13] Thus, the Acts and the regulations, presently, accelerate

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[8]Alex Mirugwe, Adoption of Artificial Intelligence in the Ugandan Health Sector: A Review of Literature. School of Public Health, Makerere University, Kampala, Uganda. April 2024.
<file:///C:/Users/Dr.%20Azeez/Downloads/SSRN-id4735326.pdf. Accessed 30 July 2024>, accessed 12 August, 2024..

[9] Ncube C., Oriakhogba D., Rutenberg, and Schonwetter T., Artificial Intelligence and the Law In Africa, Lexis and Nexis February,2024, <file:///C:/Users/Dr.%20Azeez/Downloads/AIandtheLawinAfrica%20(1).pdf>, accessed 30 July 2024.

[10] Isaac Christopher Lubogo, Legal Personhood of Artificial Intelligence, 2022, Jescho Publishing House A member of   Jescho   Group   Ltd   Maria's   Galleria,   Kampala,   Uganda, <file:///C:/Users/Dr.%20Azeez/Desktop/AI%20%20IN%20UGANDA/16TH%20AUGUST%20Legal%20Personhood%20of%20Artificial%20Intellience.pdf>, accessed 31 July 2024.

[11] Saul Mukasa, Op.cit.

[12] Ibid.

[13] Harriet Nankya, 'Governance paper Regulation of health data for AI in Uganda', in Ethics of AI in global health research, Global Forum on Bioethics in Research, Cape Town, 29 & 30 November 2022,

Uganda's digital transformation process, strengthen digital infrastructure and connectivity, support digital services, foster entrepreneurship and innovation, enhance literacy and digital skills, and promote data protection, cyber security, privacy, and intelligence.[14]

While Uganda does not have a comprehensive legal framework specifically enacted for AI, it should be noted that inferences could be made to these laws and regulations and the same could be applied to various aspects of AI, such as the need for data protection, observing privacy, cyber security and safety of intellectual property as can be gleaned from the following statutes:

The Data Protection and Privacy Act, 2019:

This law ensures the protection of personal data and the privacy of individuals by regulating the collection and processing of personal data. It protects the rights of individuals whose data are collected and the responsibilities of data collectors, data processors, and data controllers. It regulates the use or disclosure of personal data. And other related issues.[15] It sets out principles for data collection, storage, and processing, which are relevant to Artificial Intelligence systems that handle personal data.

Computer Misuse Act, 2011:

This Act addresses various forms of cybercrime and misuse of computer systems. It includes provisions that can be applied to Artificial Intelligence in terms of unauthorized access, data breaches, and cyber-attacks. It ensures the security of electronic commerce and information, prevents unauthorized access, misuse, or abuse of information (including computers), ensures security in a reliable environment in the electronics industry, and provides other relevant regulations.[16]

Communications Act, 2013:

<https://www.gfbr.global/wp-content/uploads/2022/12/Harriet-Nankya_GFBR-2022_Theme-4.pdf>, accessed 31 July 2024.

[14] Uwwera Harmony Leaticia, The Impact of Artificial Intelligence on Copy Right Law in Uganda, 2024, School of Law, Ugandan Christian University, <https://scholar.ucu.ac.ug/server/api/core/bitstreams/c4e00b2f-1cee-432f-92b3-dc8a95400f2d/content>, accessed 30 July 2024.

[15] The long title of the Data Protection and Privacy Act, 2019.

[16] The long title of the Computer Misuse Act, 2011.

This Act governs the communications sector in Uganda, including the regulation of ICT infrastructure and services. It can be relevant to Artificial Intelligence in terms of telecommunications and broadcasting.

Intellectual Property Laws:

There are various laws related to intellectual property, such as the Industrial Property Act, the Copyright Act and the Neighbouring Rights Act of 2014 that protect intellectual property rights which is relevant to Artificial Intelligence innovations and creations.[17] The Act provides for the promotion of creation and innovation, the promotion of access to technology, through the authorization and management of patents, utility models, design and technological development, and provides for the establishment and operation of the Registry Officer for the establishment of the property registry and other related matters.[18]

National Information Technology Authority-Uganda (NITA-U) Act, 2009:

This Act provides various guidelines related to Information Communication Technology (ICT), which could impact the development and deployment of Artificial Intelligence and technologies in Uganda.[19]

Electronic Transactions Act, 2011:

This Act provides for the use, security, and development of electronic transactions and communications. It is therefore relevant to Artificial Intelligence in terms of electronic contracts and digital signatures.

It is noted from the foregoing that Uganda lacks specific laws that address AI ethics, liability, and accountability. This deficit in the legal framework of Uganda poses challenges, specifically on the ethical application of AI and the protection of human rights[20]. However, in a bid to develop an institutional framework to monitor the developments emerging from AI, the Uganda Communications Commission (UCC) Task Force was established by the Uganda Communications

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[17] Copyright and Neighbouring Rights Act, 2006, and the Industrial Property Act 2014.
[18] Long title of the Industrial Property Act 2014.
[19] S. 3(1) of the National Information Technology Authority, Uganda Act, 2009.
[20] Esther Nabukenya, 'AI Ethics in Uganda: An Emerging Discourse' (Uganda Law Review, 2023) 45.

Commission with the mandate to initiate AI applications in communications,[21] focusing on researching new AI technologies, assessing infrastructure creation, and solving data management practices and issues. They are also required to review existing laws and regulations related to AI, identify gaps and issues, and explore best practices and practices in the world.[22]

3. Trends and Extent of AI Application in Uganda

The world is witnessing a revolution driven by AI, from advances in medicine to advances in agriculture, the potential of AI to solve global problems is undeniable. Several African countries are embracing the technology with great enthusiasm.[23] The East African Community (EAC), as one of the African regional economic blocks, has worked to produce non-binding instruments with relevance to AI, which is known as the EAC Legal Framework for Cyber Laws. Countries like Uganda are becoming hotbeds of AI innovation. Uganda is at no. 123 in the 2023 AI Index rankings and the number of companies that specialize in AI in Uganda is estimated to be 44.[24] The cybersecurity risks and potential for abuse associated with the use of AI are increasing. Hackers and other malicious actors are now using the power of AI to transform threats and create more sophisticated attacks.[25]

Several AI initiatives have been instigated in Uganda over the past few years. For instance, the government has aligned with international organizations such as the United Nations Development Programme (UNDP) to influence AI in areas like healthcare, agriculture, and education[26]. In

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[21] The task force was launched by Dorothy Okello, Chairperson of the UCC Board. For details, see Ssebwami J, 'PML Daily', <https://www.pmldaily.com/business/tech/2024/07/ucc-establishes-ai-task-force-to-develop-framework-for-adoption-and-utilization.html>, assessed 13 August 2024.

[22] Ibid.
The top five African countries in the 2022 Global Government AI Readiness Index are: Mauritius (57th), Egypt (65th), South Africa (68th), Tunisia (70th), and Morocco (87th). The rankings of these five African countries are due to their good performance in government fundamentals such as national information vision, creation of online services, availability of information security and privacy policies, and development of strategies such as cybersecurity. See Abdessalam Jaldi, Artificial Intelligence Revolution in Africa: Economic Opportunities and Legal Challenges, 2023, <https://www.policycenter.ma/sites/default/files/2023-07/PP_13-23%20%28Jaldi%20%29.pdf.>, accessed 31 August 2024.

[24] Ibid.

[25] Saul Mukasa, 'Uganda's future lies in leveraging artificial intelligence', The Observer, 20th Septmeber, 2023, <https://observer.ug/viewpoint/79246-uganda-s-future-lies-in-leveraging-artificial-intelligence>, accessed 29 July 2024.

[26] United Nations Development Programme (UNDP), 'AI for Development in Uganda' (UNDP, 2020) <https://www.undp.org/uganda>, accessed 5 August 2024.

healthcare, AI-powered tools are being used for disease diagnosis and management, particularly in remote areas where access to medical professionals is limited[27]. Furthermore, AI-driven agricultural technologies are aiding in optimizing farming practices, which is vital given Uganda's reliance on agriculture for economic stability[28].

The private sector has also been instrumental in driving AI innovation. Companies like Safeboda and Xente have integrated AI into their day-to-day operations, thus boosting services like ride-hailing and digital financial transactions.[29] Moreover, academic institutions such as Makerere University have formed AI research labs that are centered on fields and specializations like machine learning and data science[30].

The AI revolution has begun quietly taking place in Uganda since the beginning of 2024. It is being integrated into the national framework for enabling safety advancements across industries. This section addresses the heart of this transformation by presenting real-world examples of the power and potential of AI that is moving Uganda towards a better, prosperous, and safer future regarding its utility in the following sectors:[31]

i.   *Public Service Delivery*

In this era of the Fourth Industrial Revolution (4IR) where AI is at the forefront, advances in technology are changing the way governments around the world deliver services to their citizens. The government of Uganda is not an exception to this development, as it has deployed AI technology to some of its Ministries, Departments and Agencies (MDAs)[32] to:

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[27] Joshua Ninsiima, 'AI in Healthcare: Transforming Uganda's Health Sector' (Makerere AI Lab, 2021) <https://ai.mak.ac.ug/healthcare>, accessed 5 August 2024.

[28] Fiona Namukwaya, 'AI in Agriculture: Opportunities and Challenges in Uganda' (African Journal of AI and Agriculture, 2022) 23.

[29] 'AI in the Private Sector: The Case of Safeboda and Xente' (Daily Monitor, 12 March 2023) <https://www.monitor.co.ug/business/AI-in-private-sector>, accessed 5 August 2024.

[30] Makerere University, 'AI Research at Makerere' (Makerere University, 2021) <https://ai.mak.ac.ug/research>, accessed 5 August 2024.

[31] Artificial Intelligence and Sustainable Development: How AI is Transforming Uganda in 2024 - Case Studies <https://www.treppantechnologies.com/post/artificial-intelligence-and-sustainable-development-how-ai-is-transforming-uganda-in-2024-case-st>, accessed 28 July 2024.

[32] These included the Uganda Investment Authority (UIA), Uganda Revenue Authority (URA), Uganda National Meteorological Authority (UNMA), Uganda Electricity Transmission Company Limited (UETCL), Uganda Electricity Distribution Company Limited (UEDCL), and Kampala Capital City Authority (KCCA). See Nalubega, T. & Uwizeyimana, D.E., 2024, 'Artificial intelligence technologies usage for improved service delivery in Uganda',

(a) Increase efficiency, productivity, and accuracy;

(b) Solve environmental problems;

(c) Enhance fraud detection and heighten security, and;

(d) Facilitate personal and public service private actions.[33]

ii.   *Smart Farming/Agriculture*

Ugandan agriculture is beginning to use AI to improve agricultural productivity and reduce the impact of food insecurity. Project FARM is an AI platform that analyzes farmer activity patterns and generates insights. At the forefront of this effort is the work of female software developers like Nazirini Siraji from Mbale who built the Farmer App using Google's open source learning platform technology, TensorFlow, to prevent the Fall Armyworms from damaging the crops.[34] Another area of smart farming expansion in Uganda is in the use of 'Yo! Labs'; is an AI-powered smart app that analyzes weather and soil data to provide personalized recommendations to smallholder farmers. The application of this AI technology has increased yields by 20% for thousands of farmers, and this AI discovery is gradually leading to food security and sustainable agricultural development. Also, the National Agricultural Research Organization (NARO) has developed an AI-based disease diagnostic for cassava. It uses image recognition to predict and prevent the spread of cassava mosaic disease, saving millions of dollars and ensuring food security for millions of people.[35]

iii.   *Health Care*

On 30th May 2024, the Government of Uganda, in collaboration with Makerere University, took a significant step towards improving the healthcare system through the use of technology by opening an AI Health Lab. The Permanent Secretary of the Ministry of ICT and National Guidance, Dr.

Africa's Public Service Delivery and Performance Review, p.5, 12(1), a770. https://doi.org/ 10.4102/apsdpr.v12i1.770 or <file:///C:/Users/Dr.%20Azeez/Downloads/770-8812-1-PB%20(1).pdf>, accessed 31 August 2024.

[33] See Ibid., p. 1.

[34] Laura Foster, Katie Szilagyi, Angeline Wairegi, Chidi Oguamanam, and Jeremy de Beer, 'Smart farming and artificial intelligence in East Africa: Addressing indigeneity, plants, and gender', *Smart Agricultural Technology,* 3 (2023), pp.1-2. <https://www.sciencedirect.com/science/article/pii/S2772375522000971?via%3Dihub>, accessed 31 August 2024.

[35] See Ibid.

Aminah Zawedde, while opening the Lab, stressed that such a pioneering initiative aims to revolutionize the healthcare system by using AI to increase the healthcare system in the country. She adds that as Uganda is entering into the era of innovation and advancement in healthcare through AI, the milestone represents a step forward towards acquiring and experiencing the transformative power of AI and its ability in medicine to transform diagnosis, treatment planning, and personal care. She further acknowledged the government's ongoing efforts to integrate AI in healthcare through initiatives such as telemedicine platforms, health data analytics, and AI-driven solutions in medical and pharmaceutical research.[36] Other speakers at the occasion emphasized that AI could enable more accurate diagnosis and treatment, support global pandemic planning and response, inform health decision-makers, or allocate resources for healthcare. They however opined that, for a country to reap the full benefits of AI, ethical issues surrounding its development and use need to be resolved. They also highlighted the legal key issues to be considered in the application of AI in the healthcare sector, which include data consent, data security, and transparency, algorithmic fairness and impartiality, and data privacy. These, according to them, require the government to finance, develop, and manage AI technology to improve the quality of health technology and prioritize ethical and social responsibility that may emerge from its application.[37] In addition to that, the Ministry of Health is using an AI-based malaria monitoring system that analyzes satellite imagery and weather data for suspected mosquito breeding sites. This effort is said to be systematically reducing malaria cases by 15%.[38]

iv.   Climate Change and Environmental Issues

The climate change problem is global, and based on this, Ugandan policymakers and scientists are doing everything possible to use all available tools to address climate change. The National Environmental Protection Agency's AI-based air quality monitoring system tracks pollution levels in real-time and predicts air quality trends. This allows policymakers to make informed decisions about cleaner air and a healthier environment.[39] Makerere University, on the other hand, has

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[36]James Anyango, 'Uganda Launches AI Health Lab at Makerere University', Mak News, 31 May 2024. <https://news.mak.ac.ug/2024/05/uganda-launches-ai-health-lab-at-makerere-university/>, accessed 29 July 2024.

[37] Ibid.

[38] Ibid.

[39] See Cadreen Barungi Kabahizi, How AI could transform Uganda's Eduscape: Paving the Path for Blended Learning, Twesiime Jordan McGurran Ed., Africa Policy Centre, Uganda Christian University, p. 7. July 2020, <https://api-ucudir.ucu.ac.ug/api/core/bitstreams/6bf65731-98f6-46b1-b389-24268dc2f65c/content>, accessed 2 August 2024.

developed a variety of projects based on AI technology to solve environmental problems. Some of these projects include:

a. *AirQo:*

This project was established by Makerere University Artificial Intelligence Research Group (AIR Lab) specializing in using AI and data science to solve environmental problems in Uganda. AIR Lab, supported by Pulse Lab, has developed AirQo; a comprehensive air data monitoring system analyzing and modeling program that aims to achieve clean air for all Ugandan cities through the use of data that were provided. The program uses machine learning and AI to collect and analyze data so that it can help raise awareness of climate change and inform policy decisions.[40]

b. *WEMEA-ICT:*

WIMEA-ICT is an integrated research and capacity-building initiative that aims to improve climate management in the East African region through the development of ICT-based solutions. It is funded by the Norwegian Development Cooperation Agency (NDCA) under the Norwegian Capacity-Building Programme for Higher Education and Research Development (NORHED) scheme. The project is being carried out in collaboration between Makerere University in Uganda, Dar es Salaam University of Technology (DUT) in Tanzania, the University of Juba in South Sudan, and the Geophysical Institute of the University of Bergen, Norway. The project identifies the importance of weather data and the problems that result when weather predictions are inaccurate. One of the five components of the project that incorporated AI is the development of numerical weather prediction models for the East African region.[41]

v. *Education*

Uganda is currently leveraging Artificial Intelligence to enhance teaching and learning outcomes in several areas:[42]

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[40] Isaac Rutenberg, Arthur Gwagwa, and Melissa Omino, Use and Impact of Artificial Intelligence on Climate Change Adaptation in Africa, p. 12, 2021, <https://link.springer.com/content/pdf/10.1007/978-3-030-45106-6_80.pdf>, accessed 1 August 2024.

[41] Ibid., p. 11-12.

[42] Ibid., p. 8.

a. Blended Learning

The teaching process in Uganda is now shifting from being teacher-centered to being a learner-centered one. It is this learner-centered approach in education that opens the country to the role AI is now playing in this arrangement, as AI's main role in education is to enhance learner-centered approaches and transform the whole education. Blended learning has continuously been adopted by many educational institutions in Uganda as a new strategy to speed up the transformation of the whole eduscape in the country.[43]

b. Engagement with ChatGPT (Chat Generative Pre-Trained Transformer) to answer Questions:

It is an artificial intelligence website that retrieves text, audio, and video content from the web and answers questions from human users. It does this by searching the Internet for answers to questions. In just two months since its public launch, ChatGPT has already reached 100 million users worldwide, Uganda inclusive. As a result, AI tools are now impacting healthcare, geography, academic journalism, and even life sciences. For example, students are now using AI systems like ChatGPT to answer exam questions. The problem here is that the learning impact will be on students who receive grades and qualifications that are not their own. For example, the Wharton School of Business at the University of Pennsylvania and the University of Minnesota Law School recommend and accept ChatGPT to answer questions. The guiding question is who owns the responses generated by ChatGPT. Did the student submit the paper or the paper device used to obtain the answers? These ethical and legal issues have led people to consider how to manage and use the creation of intellectual property created by AI worldwide.[44]

vi. Legal Profession

AI Justice Delivery is revolutionizing Uganda's legal system. The justice delivery system is embarking on a journey of transformation by incorporating AI into its operations. Facing

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[43] An Eduscape, as defined by Cadreen Barungi Kabahizi, is 'constituted by the ideological visions and political structures that take place in local schools as the daily administration of time, activity and place, the practices of teaching and learning in classrooms, the construction of social relations and of agents' (i.e. teachers' parents' children and young people's) imaginations of the optional worlds that are seen as consequences of schooling'. Ibid., p. 4.

[44] Sekou Owino, Bizarre, 'Intriguing civil cases and decisions in the year 2022, Nation Media Group, 14 Jan 2023, <https://nation.africa/kenya/blogs-opinion/opinion/bizarre-intriguing-civil-cases-and-decisions-in-the-year-2022-4086628>, accessed 1 August 2024.

increasing challenges such as backlogs and limited access, Uganda's legal system is leveraging AI to transform its approach to justice. As societies around the world grapple with the rise of AI, Ugandan judges are poised to use technology to make the law more efficient, effective, and user-friendly. Potential Ugandan judges, who have historically relied on traditional methods, are now acquiring the technical expertise to eliminate inefficiencies. The use of electronic methods, including electronic identification and telephony, has essentially disappeared. These innovations, along with the use of AI tools like ChatGTP and Case Mine, represent a revolution in law enforcement. AI integration promises great benefits, but it also creates risks that must be addressed to protect the integrity of justice. In the context of AI applications, concerns about accuracy, privacy, bias, and security vulnerabilities have become important. Relying on archived information may result in reliance on inaccurate or illegal information that could affect the outcome of legal decisions. Mitigating these risks requires taking rigorous measures, including verifying the reliability of the information being used from trusted sources such as Google Scholar. Ensuring privacy, confidentiality, and accountability in AI processes is also critical to maintaining public trust in the rule of law. Establishing clear boundaries and specific responsibilities can help protect disclosure and reduce the risk of bias in AI outcomes. If Uganda's judicial system is to address the complexities of AI integration and realize its full potential for justice, it will require an impartial approach that balances practical implications with ethical considerations.[45]

AI is changing the legal profession in many ways through the improvement in the data entry system. As the legal business is growing, AI has taken over many legal tasks, freeing people up to perform more important tasks like pre-reviewing documents and traditional physical communication. The good news is that this trend is also growing in Uganda. Some law firms, such as KTA Advocates (Karuhanga, Tabaro & Associates) and Dentons firm, are already committed to AI software. They have incorporated AI into their systems and the way they deliver their services. For example, the hourly fee of a lawyer is automatically calculated and delivered to the client through an intelligent smart app. However, AI brings with it a large investment and responsibility. One of which is that AI will not answer questions that require critical or creative thinking. AI can only perform tasks that humans have programmed it to do. Therefore, AI will be

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[45] <https://www.binance.com/fr/square/post/3303109182930?ref=39532474>, accessed 29 July 2024.

more effective when it is programmed or being directed, or handled by legal professionals who understand the Law.[46]

Many African countries, including Uganda, Nigeria, Kenya, South Africa, and Zimbabwe have published practical guides on electronic data management or digital justice projects. In Uganda for example, the Electronic Court Case Management Information System (ECCMIS) was launched in March 2022 at the Kampala Court and has been installed in some of the country's highest courts. Speaking at the launch, Senior Information Technology Officer, Ssinabulya Joseph, said that ECCMIS will facilitate efficient and reliable collection, organization, distribution, and storage of large data sets, and added that the system is also designed to manage court fees/fines and generate reports.[47]

vii   Traffic Management

In the face of traffic congestion in Kampala, Uganda, the use of smart technology in traffic management has been successful, easing urban traffic congestion, improving road safety, and improving overall traffic efficiency. Traffic congestion has been reduced in areas where AI-based traffic management has been implemented. Average travel time during peak hours has decreased by 20% and traffic flow has improved by 15%. In addition, traffic accidents in these areas have decreased by 10%, indicating increased safety in areas that are well-known for traffic congestion. Road authorities cited several benefits, such as efficiency in traffic management and reduction in the need for manual intervention on the roads.[48]

4. Issues and Challenges hindering the Development of AI in Uganda

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[46] Timothy Sambwa G.K., 'Uganda's legal fraternity needs to embrace Artificial Intelligence', The Observer, 2020. <https://observer.ug/viewpoint/65598-uganda-s-legal-fraternity-needs-to-embrace-artificial-intelligence>, accessed 31 July 2024.

[47] Ncube C., Oriakhogba D., Rutenberg, and Schonwetter T., Artificial Intelligence and the Law In Africa, Lexis and Nexis February,2024, <file:///C:/Users/Dr.%20Azeez/Downloads/AIandtheLawinAfrica%20(1).pdf>, accessed 30 July 2024.

[48] Onyango Laban Oliver Owin and Namara Samantha, Artificial Intelligence Application for Traffic Management: A Case Study of Kampala Capital City Authority (KKCCA), Uganda, *International Journal of Progressive Research in Engineering Management and Science (IJPREMS),* Vol. 04, Issue 06, June 2024, pp: 2467-2471, <https://www.ijprems.com/uploadedfiles/paper/issue_6_june_2024/35277/final/fin_ijprems1720075718.pdf>, accessed 31 August 2024.

Uganda being a developing nation has encountered significant obstacles in embracing Artificial Intelligence (AI).[49] These challenges may be due to various reasons categorized into the following key areas:

i.   *Infrastructure and Connectivity:*

a.   *Limited, unstable, and privately owned internet access:* the majority of the population, dominantly in the rural areas, lacks reliable and stable internet connectivity. This has greatly hindered data collection and AI model training. Furthermore, internet service providers in Uganda are majorly managed if not owned by private entities which determine their prices and its availability.

b.   *Power infrastructure:* although Uganda is blessed with various power sources. However, frequent power outages and unreliable electricity supply continue to disrupt the use and development of AI, since it requires a constant power supply for it to be successful in its operation. This has further hindered AI development processes and the operational system of data centers.[50]

ii.   *Data Availability and Quality:*

a.   *Data scarcity:* Insufficient data on various dominions is a major challenge that has limited the ability to teach and develop AI Technology application models in Uganda.[51]

b.   *Data quality:* the quality of data and networking in Uganda often lacks consistency, accuracy, and completeness. Hence, poor data quality affects the effectiveness of AI outputs and their development. This also extends to the high cost of data and bureaucracies required in acquisition and connectivity.

c.   *Data privacy concerns:* Concerns about data privacy and security hinder data sharing and collection for AI development.[52]

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[49] Senior workforce faces challenges adapting to AI by Esther Oluka (an article in Monitor publications Wednesday 20, 2023.
[50] Navigating AI Revolution: A guide for Uganda's Strategic Approach by Musiimenta Victor Mugasa
[51] New AI Taskforce to Shape Uganda's Tech Landscape; published article by New Vision on July 26th 2024, Umaru Kashaka a journalist
[52]   <https://www.monitor.co.ug/uganda/oped/commentary/is-uganda-ready-for-artificial-intelligence--4542770>, accessed 18 August, 2024.

iii.   *Human Capital and Skills:*

a. *Skill gap:* Uganda suffers from a shortage of AI experts, data scientists, and machine learning engineers to pave the way for the careful development of AI in the country.

b. *Education and training:* The education system may not adequately favor the development of AI in Uganda. The academic syllabus has not yet embraced AI as a subject to be developed for learning. Education, learning, and training in Uganda are still premised on individual-based learning. The government policies are yet to formally domesticate and prepare students for AI-related professions and careers.[53]

iv.   *Government Policies and Regulations:*

a. *Unfavorable regulatory environment*: for AI to successfully flourish in Uganda, it requires proper regulation to control its use and to limit its abuse. However, the country still lacks a clear AI-specific regulation thereby leading to the creation of uncertainty and hindering investment.

b. *Limited government support:* while the government is still slow when it comes to AI technology development, it is, however, trending on various social media platforms, even though the government has yet to formally come out to fully fund, regulate, and support AI sensitization and research development.[54]

v.   *Ethical Considerations:*

a. *Bias in AI Technology Application:* AI models can perpetuate existing societal biases if not carefully designed and programmed.

b. *Job displacement:* Concerns about AI-induced job losses require careful planning and mitigating strategies, especially, now that it is assumed that AI is meant to replace or reduce human participation in the employment sector.

vi.   *Economic Constraints:*

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[53] Artificial Intelligence and Sustainable Development: How AI is Transforming Uganda in 2024 by Trippan Technologies

[54]   <https://www.treppantechnologies.com/post/artificial-intelligence-and-sustainable-development-how-ai-is-transforming-uganda-in-2024-case-st>, accessed 18 August, 2024.

a. *Limited investment resources:* the limited investment in AI research and development is also hindering the development of AI in Uganda. This is due to the competing priorities available.

b. *High costs:* The cost of acquiring AI hardware, software, and experts in developing and managing the AI technology also hinders its development and embracement by many organizations in the country.

5.1 Overcoming These Challenges

Addressing these challenges requires a multifaceted approach involving government, the private sector, academia, and civil society. The key strategies include the following:[55]

i.   *Investing in infrastructure development:* Expanding internet connectivity and improving electricity and power infrastructure with affordable pricing is highly recommended.

ii.   *Data initiatives:* Creating various and affordable data-sharing platforms, improving the quality of data, and establishing data usage and privacy regulations.

iii. *Talent development and skilling or developing experts:* The government and private sector are encouraged to invest in AI education and training programs, attracting and promoting AI talent and, fostering collaborations with global experts in AI development.

iv.   *Policy framework:* Developing supportive AI policies and regulations, creating incentives for AI innovation, and addressing ethical concerns are necessary measures and strategies that should be taken into consideration to overcome these challenges.

v.   *Public-private partnerships:* Public-private collaboration in sharing resources, expertise, and risks is highly required if Uganda is to register success in AI technology development.[56]

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[55] Artificial Intelligence and Emerging Technologies and their Impact on Civic Space in Africa; by Sandra Aceng, Executive Director at WOUGNET; and Florence Nakazibwe, ICNL's Senior legal Advisor for Africa
[56] Senior workforce faces challenges adapting to AI by Esther Oluka (an article in Monitor publications Wednesday 20, 2023.

5. Prospects of AI in Uganda

Despite the promising advancements made so far, AI in Uganda has encountered several difficulties. The digital gap continues to pose a significant obstacle, coupled with limited access to high-speed internet and insufficient digital infrastructure in most rural areas[57]. In addition, there is an absence of skilled professionals in Artificial Intelligence and related disciplines, which has hampered the evolution and implementation of AI technologies[58]. Another challenge is the absence of comprehensive regulatory frameworks that tackle the complexities of AI. The lack of clear guidelines and rules on AI ethics and governance could lead to potential misuse of the technology, especially in sensitive areas like surveillance and data management[59]. However, the future of AI in Uganda appears promising, provided that the underlying challenges are dealt with. Strengthening the legal and regulatory framework is vital to ensuring that AI is developed and used responsibly by the people. This comprises enacting specific AI laws to focus on and address concerns of ethics, liability, and governance[60]. Furthermore, increased investment in digital infrastructure and education is pertinent to bridging the digital gap and fostering a workforce capable of enhancing the growth and innovation of Al in Uganda. International collaboration will also play an essential role in Uganda's AI development. Partnerships with global AI leaders can provide the required expertise and resources to quicken the development and adoption of AI technologies in several sectors[61].

6. Conclusion

AI holds immense potential to drive socio-economic growth and expansion in Uganda, However, its realization centers on tackling the challenges posed by the shortage of digital infrastructure, robust legal and regulatory frameworks, as well as skills development. By ensuring a favorable environment for AI innovation, Uganda will be in a position to harness the power and capabilities of Artificial Intelligence to accomplish its Vision 2040 goals and improve the lives of its people. Thus, from the foregoing discussions, it can be confirmed that AI is a growing area being embraced by the government and private sector in Uganda. The government has established a National AI

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[57] Paul Katumba, 'Bridging the Digital Divide in Uganda' (ICT Africa, 2022) https://www.ictafrica.org/digital-divide accessed 5 August 2024.
[58] Moses Akampurira, 'Challenges of AI Adoption in Uganda' (African AI Review, 2021) 12.
[59] Ibid.
[60] Nabukenya (n 8) 47.
[61] UNDP (n 2).

Task Force, and private businesses are increasingly using AI in automated processes. It has been observed by this study that while the use and application of AI continue to grow in many fields, including the creative industries,[62] the AI law in Uganda is still in its infancy, as there is no specific law that addresses the issue of AI till now. However, works created by AI may have questions about authorship and ownership that can be resolved under existing laws. It is, therefore, recommended that as AI is growing rapidly in Ugandan society, there is a need to regulate it to prevent social risks. Managing AI faces many challenges that make the task impossible. By embracing the challenges, collaborating on solutions, and leading the way in embarking on AI development, Uganda can exploit the power of AI to build a sustainable and prosperous society. Traditionally, the present laws and regulations may not be able to keep up with new technologies. However, if the managers of AI understand the technology, processes, and social and ethical issues involved, it could be applied successfully and effectively. Uganda can also borrow a leaf from the EU laws in this regard, as the legislation plays an important role in ensuring an effective AI application in society. It is suggested that the government should create a policy to regulate the use of AI in all walks of life in Uganda. The framework should address subfields of AI that focus on various aspects of intelligence, including machine learning, artificial intelligence, computer vision, robotics, expert leadership, reinforcement learning, knowledge representation, and reasoning, planning, and scheduling, information searching, and several other issues related to ethics, data privacy, and security standards that will ensure effective and safety response of AI technology application in Uganda.

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