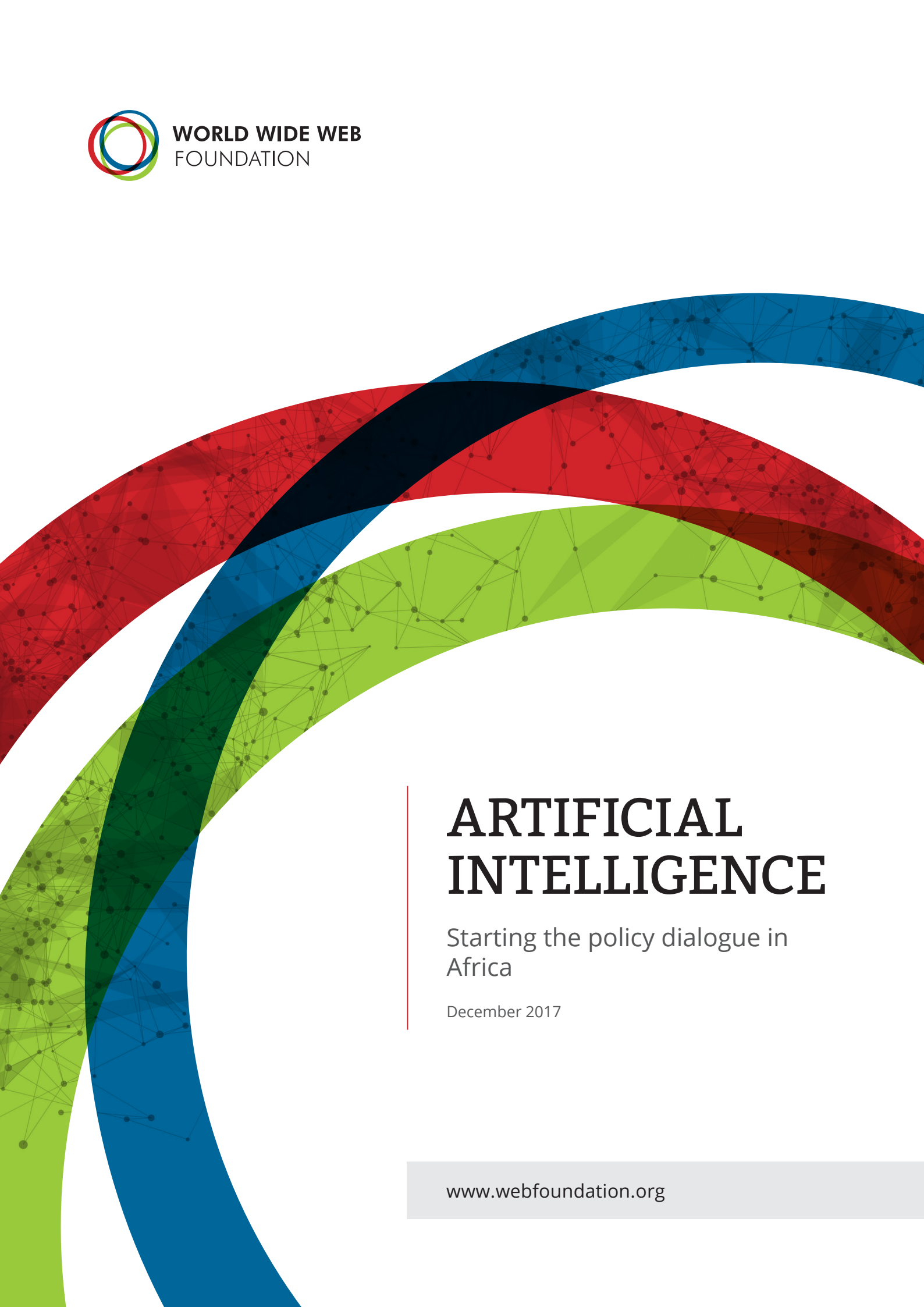

ARTIFICIAL INTELLIGENCE

Starting the policy dialogue in Africa

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CONTENTS

WORLD WIDE WEB FOUNDATION

The Web Foundation was established in 2009 by Sir Tim Berners-Lee, inventor of the World Wide Web. Our mission is to establish the open web as a public good and a basic right.

This paper has been written by Ana Brandusescu, Juan Ortiz Freuler, and Dhanaraj Thakur. Additional inputs were provided by Shaddy Shadrach, Erica Penfold, and Craig Fagan. We also wish to acknowledge and thank the Berkman Klein Center for Internet & Society for their support, and all interviewees for the time and effort they spent in the research process.

INTRODUCTION

Emerging technologies, such as those grouped under the term Artificial Intelligence (AI), present a tremendous set of opportunities and challenges to human well-being. AI can improve the way people work by creating new employment and business opportunities and automating tasks; it can improve the efficiency and delivery of public services — from education to health clinics to garbage collection; and it can strengthen the social fabric of societies by, for example, allowing multilingual societies to communicate more clearly.

At the same time, there are concerns about the potentially negative effects of AI-led automation. The World Economic Forum (WEF), for example, estimates that AI and robotics will absorb 5 million jobs by 2020; many of these positions are expected to be lost in call centres, which have served as an important economic springboard for women in low- and middle-income countries. There is also concern that AI programmes and decision-making systems supported by AI may include human biases, leading to further discrimination and marginalisation. While these opportunities and threats may sound similar to those posed by previous technological innovations, the scale of AI technology magnifies the potential impact — research by McKinsey suggests that AI could transform society "ten times faster and at 300 times the scale, or roughly 3000 times the impact" of the Industrial Revolution.

The Web Foundation takes a broad interpretation of AI, defining it as an intelligent system, which is able to solve problems by selecting the best possible action in a given scenario[1]. Many AI-powered applications are internet-based and provide services to and collect data from end-users. How AI is shaping online spaces is of great concern to the Web Foundation, which advocates for digital equality — a world where everyone has the same rights and opportunities online. Understanding the implications of AI for digital equality is critical to ensuring that everyone — including governments, companies, civil society and ordinary citizens alike — is able leverage AI's potential benefits for society, while minimising its potential risks, including its potential to exacerbate existing inequalities. This focus has lead the Web Foundation to undertake research on the social, economic, and political impacts of AI for low- and middle-income countries, which are often overlooked in current discussions about AI[2].

As a follow-up to this work, this regional brief looks at existing academic and commercial activity around AI and its potential impacts within the context of various African countries. It focuses on Africa's two largest economies, Nigeria and South Africa, and the largest economy in East Africa, Kenya[3]. In each country, we mapped current activities around AI and discussed their potential impacts with local experts. Many of the activities are focused on the areas of health, public transportation, agriculture, and language development.

Such a regional focus has helped to highlight important and emerging areas for policy development that can help to leverage AI for the public good. The findings provide an initial policy roadmap not just for South Africa, Nigeria and Kenya, but for Africa and other regions. This study should be seen as a first step toward exploring the findings and questions raised, particularly in non-English speaking countries in Africa (i.e. Lusophone and Francophone), and across the world.

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1 This includes machine learning and deep learning, programs that can learn and improve themselves with experience. For a more detailed discussion on the elements of AI see the Web Foundation's White Paper "Artificial Intelligence - The Road Ahead in Low and Middle-Income Countries"

2 See: https://webfoundation.org/docs/2017/07/AI_Report_WF.pdf and http://webfoundation.org/docs/2017/07/Algorithms_Report_WF.pdf.

3 Based on GDP in 2016 (World Bank - World Development Indicators).

Our research found several examples of AI applications geared towards addressing local development challenges in each country. These included applications in key sectors such as health, agriculture, financial technology (fintech), public transportation, and also in specific areas such as improving language learning and use. In most of these sectors, AI is being used to circumvent existing economic inefficiencies and to improve access to public and private services. Examples of initiatives in all three countries include:

1.1 Health

Kenya: Sophie Bot (a free chatbot that works on several popular messaging apps) relies on AI to process and reply to questions on sexual and reproductive health. According to an interviewee, people can access the application more easily and freely than going to a doctor.

South Africa: Citizens in regions without primary healthcare facilities are often reliant on the services of mobile clinics. Numberboost is a company working to develop a system to allow citizens to locate nearby mobile healthcare clinics — a service that could help improve citizen access to healthcare.

1.2 Agriculture

Kenya: Vital Signs analyses pixels' value and color from satellite imagery data to estimate rainfall and drought patterns. Arifu provides curated access to information via SMS to help farmers determine, for example, what fertilizer matches their specific needs. FarmDrive offers credit for farmers in need of supplies (e.g., fertilizers) by relying on data such as the size of land, location, and crops to determine the risk and corresponding interest rates.

Nigeria: Zenvus seeks to improve decision-making for farmers by providing insights based on data collected from sensors and other means.

South Africa: Aerobotics is assisting the agricultural industry by using drone aerial imagery to identify problems in crop yields, which is important considering the challenges faced by the industry including sustained periods of drought.

1.3 Fintech

Kenya: Tala uses a mobile app to assess and disburse loans to customers that do not have a credit history. Through the app, the company can assess these traditionally excluded customers by analysing Facebook and SMS data to determine a customer's risk of default.

Nigeria: Kudi.ai has developed a system that allows users to improve money transfers. Using natural language processing and artificial intelligence, Kudi.ai attempts to make peer-to-peer payment easier for Nigerians using a chatbot that works on popular messaging apps, like Facebook Messenger.

1.4 Public Transportation

Nigeria: RoadPreppers have developed a solution that allows users to navigate traffic congestion with driving directions and public transport options. In addition, the app lara.ng uses a chatbot to provide public transportation directions and fares for commuters in Lagos. Both are viewed as better than existing options, such as Google Maps; as an interviewee noted, they provide the commuter with more transparent information on fares from different public transport providers.

1.5 Natural Language Processing

South Africa: Council for Scientific and Industrial Research (CSIR) works on the use of automatic speech recognition to support language learning and translation. This is an important and complex task given that there are eleven official languages in the country, with most existing language technology options limited to English and Afrikaans.

As elsewhere around the world, artificial intelligence is generating great expectations in Africa. Our research identified unique trends around AI development across Kenya, Nigeria and South Africa:

Local knowledge will allow regional players to capitalise on global trends.

Much of the information circulating amongst local researchers regarding technology developments and trends comes from the United States and Europe (though India was also mentioned). That is not to say there is no awareness of the regional and local context — many interviewees acknowledged that contextual specificity and knowledge will provide local companies with comparative advantages vis-a-vis non-regional players.

Connectivity, infrastructure and other challenges may limit local AI entrepreneurship.

Local entrepreneurs are faced with a number of obstacles to deploying this local expertise in the AI field, including access to stable internet connections, limited sources of finance, and frequently insufficient complementary infrastructure (e.g., electricity, roads). Given these hurdles, several interviewees in South Africa, for example, suggested that AI is currently a pursuit only accessible to the elites, given the extensive educational and other resources required for involvement. Though several universities in the countries surveyed facilitate courses on machine learning and other AI-related topics, the tech leaders interviewed for this report suggest that the available talent pool today falls short of existing demand.

Government engagement in the promotion of AI research and use is low.

While the governments of all three countries have, to varying degrees, taken steps to promote of STEM (science, technology, engineering, and mathematics) education and training, much more can be done. According to interviewees, civil servants are not directly engaging in developing AI solutions for government services, which might hinder their ability to provide appropriate incentives and regulation in the short term. Indeed, outside of financial support for academic research (for example in the case of South Africa), the lack of government engagement in AI, particularly at the policy level, is one of the gaps highlighted by many interviewees in all three countries.

Networking events are important opportunities for knowledge sharing and collaboration.

Across all three countries, periodic meetups help to provide the space needed for technologists, including youth, to share skills, learn from expert presentations, and network — especially at a local level. These networking events — organised through the likes of Data Science Lagos, Data Science Nairobi, and the Machine Intelligence Institute of Africa (based in South Africa) — help those working in the field to connect and to develop commercial and other opportunities around AI.

Women remain largely excluded from the AI field.

As throughout the technology sector, a significant gender imbalance persists in the AI field. Although the efforts and successes of meetup groups such as Women in Tech ZA, and the Women in Machine Learning and Data Science (WiMLDS, Nairobi chapter) are notable, according to the interviewees, women remain largely underrepresented in the field[1]. As noted in our previous research, a male dominated field has negative implications for the development and impacts of AI. This gender imbalance will reverberate through the job market, and can foster application designs that can reproduce and exacerbate the problems of unequal societies.

Public data is in short supply. Machine learning, by definition, requires data.

Startups interviewed for this research noted that though access to public datasets is crucial for developing locally relevant services — for example, access to land records can help to develop solutions for improving agricultural outputs. Unfortunately, interviewees from all three countries noted that in many cases, access to such public data is difficult and requires navigating through too much red tape.

More needs to be done to develop and retain local AI talent.

Across all three countries, there were concerns about improving existing STEM educational programmes to meet the future needs of local AI industry and academia. In addition, brain drain is a significant concern in this sector (as with other sectors in low- and middle-income countries), as local talent is systematically recruited by large US and European companies working on AI, including Google, Facebook, and Apple.

1 Perhaps the most vivid example of this is the WiMLDS in Nairobi. Though the meetup specifically targets women, one of its organisers stated that men attend the meetups regularly, whereas women often do not come back after an initial meetup, sometimes leading to a male-dominated discussion.

If African governments are keen to see AI developed and deployed on the continent, policy discussions on how best to support the local AI ecosystem are needed — and are currently not happening.

Technological developments are occurring very quickly, and given the risks and opportunities associated with the expansion of AI-based applications, it is essential for governments to reassure all stakeholders that an ecosystem that effectively maximises potential and minimises harm is being developed. A policy environment that addresses the application of AI technologies — including policies based on an assessment of the benefits and risks of AI — is essential. Governments, companies and civil society must stimulate such a conversation. These actors must work together — not in silos — to ensure that locally viable AI is being developed and deployed, and generating benefits for the population.

We have outlined some initial entry points to establish this policy space. These are drawn from this brief's findings, our discussions with experts in all three countries, and our wider work on AI in low- and middle-income countries. These suggestions should be viewed as helping to initiate and frame local discussions around the development and adoption of AI to support the public good.

1.1 AI and Governance

- **Work towards a national strategy on AI and new technologies, developed through broad multi-sectoral consultation,** such as through forums for the discussion of AI policy and related issues. Some stakeholders noted that while such forums do not yet exist, they can provide important opportunities for industry, academia, government, and civil society to interact in this space.
- **Develop public sector expertise in AI, with leadership in relevant ministries leading this effort.** This can be done in collaboration with universities and other institutions already working on AI in the country, as well as with regional and international organisations.
- **Establish and define codes of conduct** for the responsible use of data and algorithms by the public sector.
- **Support AI to improve the delivery of public services and public goods**, in particular those that target marginalised groups.
- **Ensure the creation of systems of transparency, liability, accountability, justification, and redress for decisions made on the basis of AI.** This includes enabling the auditing of algorithms on social media and other relevant platforms by civil society and government.

1.2 AI Training and Research Development

- **Ensure that trainings for AI development of AI are accessible by all**, including low-income groups. AI should not be made by and for the elite. This includes providing support for training and relevant skills development for both women and men.
- **Invest in local research in AI, including in the STEM and social science/humanities fields.** This should include multidisciplinary and interdisciplinary collaborations with academics (e.g. ethicists, ethnographers, lawyers, social scientists, computer scientists, engineers, etc.) to examine the ethics of AI and related policy issues as the sector grows.

1.3 AI and the Demand for Data

- **Promote access to free, open, and anonymised, curated datasets to train systems.** Using open datasets to train algorithms and support machine learning will potentially improve accountability in AI development.
- **Encourage stakeholders to use open government data in AI as a way to improve data quality** and ensure better, locally relevant datasets for AI. Governments must not only open up data, but ensure that it is of a high enough quality to be useful.
- **Promote the development of best practices and standards for AI design processes** that provide guidance on transparency and accountability in the use of personal data.
- **Ensure proper data protection legislation, regulation, and standards are in place across governments, companies, and civil society.** Without these protections, a person's data can be used against them in unwanted and potentially illegal ways, often without their knowledge. Accordingly, greater data protection can protect individual privacy, and empower people to better participate in AI-based decision-making and economic activities that use their data[1].

1.4 AI and Innovation

- **Fund local AI startups.** They have the incentives and advantages to develop apps that are more relevant to their contexts.
- **Establish frameworks to incentivise local AI innovations** that support national development goals.
- **Support AI development to address employment.** This can follow the approach already established by the business process outsourcing sectors in each country. In addition, this could also be done by using a micro-work model (e.g., Samasource and Amazon Mechanical Turk). This involves breaking down the AI development process into discrete tasks (such as building data sets) and employing people with varying skill-levels, but also providing protections for their labor rights.
- **Ensure greater assessment of and investment in AI in the public sector.** This could also help to improve how AI facilitates public sector accountability and efficiency.

1 Web Foundation (2017) Personal Data - An Overview of Low and Middle Income Countries. Washington DC: Web Foundation.

METHODOLOGY AND COUNTRY SELECTION

The country selection was done based on the size of the economies and that fact that Kenya, Nigeria, and South Africa are at the forefront of the technology movement on the continent, with established tech start-up networks. The objective of the research was to get a snapshot of African perspectives on the current and future social, economic, and political implications of AI — both in regards to limiting the risks of AI and maximising its beneficial uses.

The methodology consisted of stakeholder identification and outreach through contacts with existing partners in each country, open calls through Twitter (using relevant hashtags and handles of in-country data and technology experts), and snowball sampling. In each case, we conducted structured interviews that aimed to identify examples, trends, impacts, and policy recommendations on AI. Interviewees were also asked to suggest others persons from academia, industry, media, government and civil society that should be interviewed. In total, we completed 22 structured interviews between May and July 2017: eight in Kenya, six in Nigeria, and eight in South Africa. Interviewees were primarily from industry and academia, however identifying policy-makers active in this space was a challenge. While governments are certainly working on AI at varying levels, interviewees generally were not aware of this work, suggesting that this is a nascent issue for policy-makers.

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