The Development of Anticipatory Regulation for Emerging Technologies:

Harnessing Artificial Intelligence for the Greater Good

Authors:

Ana CHUBINIDZE

Constanze JEITLER

Jakub VELIC

Agency: UNDP

Mentors: Benjamin KUMPF

Counsels: Katharine SARIKAKIS

Abstract

This paper seeks to address the particular challenges and risks Artificial Intelligence (AI) as an emerging technology creates for regulators and policy makers in mid- and low-income countries. AI can refer to anything from natural language processing, machine learning, algorithms, to driverless cars and autonomous weapon systems. Its development and advancement therefore has the ability to disrupt paradigms of politics, the economy, labor, administration, just to name a few. Looking at three case studies – the United Kingdom, India, and China – this paper examines emerging good practices for regulating emerging technologies and fostering economic development. The selected countries are three global leaders in terms of strategies and policies for AI, each of them approaching the issue from a different angle. For now, there are no generally accepted and tested solutions for regulating AI and harnessing its potential for the greater good. Yet, the time to act is now, especially for mid- and low-income countries as they are at risk of having to implement new technologies sooner or later without having developed an adequate regulatory framework. Thus, this paper will give recommendations for regulation for the specific contexts of mid-and-low income countries lacking such frameworks at the moment – so that in the end, everyone will profit from AI's potential without falling prey to the risks.

Key Words: Artificial Intelligence, Technology, Anticipatory Regulation, Foresight Capabilities, United Kingdom, India, China, Policy Recommendation

Contents

The Development of Anticipatory Regulation for Emerging Technologies: Harnessing Artificial Intelligence for the Greater Good

Ana Chubinidze, Constanze Jeitler, Jakub Velic

1   Introduction

Technological advancement is reshaping all aspects of human life – politics, the economy, businesses, communication, and the ways people relate to each other, the state or the media. Artificial intelligence (AI) is becoming an especially disruptive force for social, economic and political paradigms. It affects labor markets and the modes of working, financial systems or information landscapes – to name just a few – in ways where many of the consequences are not yet foreseeable. As a response to rapid changes and uncontrolled technological development, governments have begun to invest more in AI research, development and foresight capabilities. Meanwhile, international organizations, such as the European Union, the Council of Europe or the United Nations have initiated efforts for regulatory frameworks and global governance on various levels. Whether or not Artificial Intelligence and other emerging technologies should be regulated is not a question anyone is asking anymore. The questions these technologies pose are about the how, the when and the where in a time when the pace of progress exceeds the capabilities of governments to keep up: Should a completely new set of regulations be developed or should already existing tools provided by laws, directives and guidelines be applied to new technologies? If there will be a new set of rules, should they be developed on the national or the international level? Last but not least, the most eminent question to consider is probably how AI should be regulated in order to harness its potential for the greater good and the profit of all parts of global society.

The main issues on the discussion tables of national governments, international organizations and decision makers are investments in innovation, research and development, rather than foresight capabilities and regulatory frameworks. Canada, for example, is establishing excellence clusters to attract talent, and to develop the country's international profile as a global AI leader.[1] Other countries, such as Denmark, focus on creating economic growth by supporting and enhancing the digital transformation of small and medium enterprises (SMEs) by fostering digital skills, establishing public-private partnerships for digital technologies and regulatory sandboxes, as well as initiatives regarding cyber security and open government data.[2] While most government strategies include some written commitment to regulation and ethics, as well as foresight

---

[1] "Pan-Canadian Artificial Intelligence Strategy," CIFAR, accessed October 27, 2018, https://www.cifar.ca/ai/pan-canadian-artificial-intelligence-strategy.

[2] "The Danish Government Presents 'Digital Growth Strategy,'" Invest In Denmark, accessed October 27, 2018, https://investindk.com/insights/the-danish-government-presents-digital-growth-strategy.

capabilities and anticipatory regulation, there are no concrete strategies for development and implementation.

Meanwhile, international organizations have recommended or given concrete proposals on how to regulate Artificial Intelligence from a transnational or global perspective, emphasizing potential consequences for human rights. For example, the United Nations High Commissioner for Human Rights Office has dealt with the impact of AI on freedom of opinion and expression providing recommendations separately for states and for companies[3] as has called for a ban of lethal autonomous weapon systems.[4] The Council of Europe has given recommendations for safeguarding human rights and the rule of law in the age of AI and technological convergence.[5] Meanwhile, the European Union has become a role model for regulating the collection, sharing and processing of personal data as well as users' right to demand access to and deletion of their personal data through the implementation of its General Data Protection Regulation (GDPR).[6] An EU-wide regulation of non-personal data is set to follow.[7]

The particular focus of this paper on Artificial Intelligence stems from the significant challenges it generates for the regulatory system through its abilities to accumulate "knowledge" from "experiences," to act without supervision and to make its own decisions. This creates the possible risks for humans, our political, social and economic systems, as well as for other technologies. What effects have strategies and investments in AI and its regulation yielded so far and what can other countries, especially low- and mid-income countries learn from these cases? This research aims to develop recommendations for AI regulation for mid- and low-income countries.

2 Problem Definition and Paper Outline

AI can refer to anything from natural language processing used for Google Translate or machine learning which identifies faces on Facebook photos to algorithms used in e-government or systems used in driverless cars and autonomous weapon systems. Although AI has been developing already for decades, concerns about regulation have emerged only more recently since

---

[3] "OHCHR | Report of the Special Rapporteur to the General Assembly on AI and Its Impact on Freedom of Opinion and Expression," accessed December 9, 2018,
https://www.ohchr.org/EN/Issues/FreedomOpinion/Pages/ReportGA73.aspx.

[4] "OHCHR | A Call for a Moratorium on the Development and Use of Lethal Autonomous Robots," accessed December 9, 2018,
https://www.ohchr.org/en/newsevents/pages/acallforamoratoriumonthedevelopmentrobots.aspx.

[5] "Safeguarding Human Rights in the Era of Artificial Intelligence," Commissioner for Human Rights, accessed December 9, 2018, https://www.coe.int/en/web/commissioner/blog/-
/asset_publisher/xZ32OPEoxOkq/content/safeguarding-human-rights-in-the-era-of-artificial-intelligence.

[6] EUR-Lex, "Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC (General Data Protection Regulation)," accessed December 9, 2018, https://eur-lex.europa.eu/eli/reg/2016/679/2016-05-04.

[7] "Proposal for a Regulation of the European Parliament and of the Council on a Framework for the Free Flow of Non-Personal Data in the European Union (COM(2017)495)," Digital Single Market, accessed December 9, 2018, https://ec.europa.eu/digital-single-market/en/news/proposal-regulation-european-parliament-and-council-framework-free-flow-non-personal-data.

the acceleration of technological development in the field over the last decade. The data collected on individuals processed by AI is used in business to offer new services, in social media to moderate news feeds, targeting advertisements, determining healthcare treatment plans and so on. But AI will not only alter how information is processed, it will consequently also lastingly change the political and judicial system, industrial production, business and retail, transport, agriculture, not to mention defense and security. Despite its impact on all aspects of life, most of us have little knowledge of how these systems and technologies work and how they make decisions that could potentially alter one's life.

While on the surface, using personal data for targeting a particular audience might seem a trivial business need, other activities such as independent decision-making based on automated data-processing is becoming increasingly consequential. When automated algorithms determine credit scores, insurance premiums, delivery services and when social media (such as Facebook and Twitter) can sway public opinion, the effects are considerable. Concerns have emerged over the extent to which governments should regulate AI. Excessive or inappropriate policies can not only create a bottleneck, but also leave the true challenges - both present and future - unanswered. Former White House deputy Ed Felten believes that governments can work to prevent this: "One way to do it is to create policies that are designed by looking at the big picture rather than being very closely tailored to the current state of technology. As an example, rather than dictating which technologies should be used in certain settings, it makes more sense to have a performance standard".[8]

While some countries such as UK, US, China and Germany are investing in AI research, development and foresight capabilities, mid- and low-income countries are in danger of lagging behind. In some cases, developing countries not only lack resources for research and development but also for acquiring new technologies in order to increase productivity or improve political or judicial administration. As machines are improving and changing rapidly, mid- and low-income countries hardly catch up with the changes and developments in innovation. This not only has consequences for research and innovation, but also - due to AI's disruptive potential - has far wider implications for social, political and economic development in general. The solution can lie in identifying areas where AI is relevant for mid- and low-income countries without attempting to reinvent the wheel and at the same time use existing good practice examples and proven ideas.

Strategic documents and declarations of intent exist on the national, transnational and international level. Yet those include mainly national initiatives to regulate or develop Artificial Intelligence. Governments and parliaments in industrial countries have started initiatives to develop foresight capabilities for emerging and future technologies. Mid-income countries are in need of universal guidelines based on best practice examples. UNDP could be key in developing and providing such guidelines, outlining areas where regulation is needed in order to guarantee sustainable development, growth and safety, especially to unlock the potential of emerging technologies – including AI -for the most marginalized.

---

[8] Bianca Datta, "Can Government Keep Up with Artificial Intelligence?," PBS.org, accessed December 22, 2018, https://www.pbs.org/wgbh/nova/article/ai-government-policy/.

While trying to utilize the technology as the source of advancement, countries are exposed to its risks as well if they are not able to regulate it - regardless of their income level. Efficient guidelines for emerging technologies need to be designed in a way that they neither kill off or freeze innovation, nor are toothless or lagging behind rapid developments. In order to ach

ieve such guidelines, this needs joint efforts of governments, developers, investors, academics, civil society as well as international organizations. This paper seeks to answer the following questions: First, what can be learned from developed countries and their regulatory practices for emerging technologies and second, how can mid-income countries harness AI for sustainable development?

This research explores existing approaches towards AI regulation recognizing that as an emerging field, the specter to maneuver is much wider – there are no already accepted and tested solutions proposed in the literature or in practice. We will examine already existing initiatives and emerging good practice examples from individual states, in order to give recommendation for the specific contexts of mid-and-low income countries lacking such frameworks at the moment. Bearing in mind both the domestic situation as well as the international context(s) which such countries are embedded in, our paper addresses AI from two different angles: First, the impact AI might have on the economy, human rights and security; and second the development perspective, looking at the risks and opportunities AI and its potential regulation bring for sustainable development. Developing countries are especially at risk as sooner or later they will also have to implement new technologies without having developed frameworks for regulation.

3 Key Concepts: Artificial Intelligence, Machine Learning, Anticipatory Regulation

In his recent report from August 2018 as UN Special Rapporteur on the Promotion and Protection of the Right of Freedom of Expression and Opinion David Kayes defined Artificial Intelligence not as one thing, but rather as a constellation of processes, systems and technologies that enable "computers to complement or replace specific tasks otherwise performed by humans, such as making decisions and solving problems."[9] The term Artificial Intelligence however was already coined in 1956 by the American computer scientist and cognitive scientist John McCarthy and initially was supposed to refer to "thinking machines," including cybernetics, complex information processing and automata theory.[10] AI can be divided into various types and distinctions. There is the classifications into Strong AI, Weak AI and everything in between as to illustrate the spectrum from systems imitating human intellect to systems that can only behave

---

[9] "OHCHR | Report of the Special Rapporteur to the General Assembly on AI and Its Impact on Freedom of Opinion and Expression," accessed December 9, 2018,
https://www.ohchr.org/EN/Issues/FreedomOpinion/Pages/ReportGA73.aspx.
[10] Bernard Marr, "The Key Definitions Of Artificial Intelligence (AI) That Explain Its Importance," Forbes, accessed December 22, 2018, https://www.forbes.com/sites/bernardmarr/2018/02/14/the-key-definitions-of-artificial-intelligence-ai-that-explain-its-importance/.

like humans.[11] Another distinction can be made between Narrow AI, that is systems executing specific tasks autonomously, and General AI, referring to systems that have the ability for general reasoning.[12] Today, most AI systems are neither weak nor strong, neither narrow nor general, but they are something in-between by using human reasoning as a means to deliver better services and products. This approach is evident in the modern dictionaries as well. That is, they define AI as a sub-field of computer science which imitates human intelligence rather becoming the human.[13]

Today, "AI" can be applied in manifold systems and technologies, for example as voice assistance in mobile devices, chatbots used for customer service, automated translation tools such as Google Translate, smart home devices, self-driving cars and other autonomous vehicles. AI is used for the curation of search engine results and news feeds or facial recognition in photo-sharing apps as well as state surveillance systems. Most of these applications are used in both the private and the public sector. Most of these technologies also share the trait of machine learning, meaning the techniques "used to train algorithms to use datasets to recognize and help solve problems."[14]

Until now, it has been a general assumption of law and policy makers that regulation should be constant, simple and predictable, in order to promote stability and competition.[15] However, this kind of regulation started to struggle with more dynamic, fluid and uncertain developments in fields such as technology. While current rule-making has been facts-based, ex-post, trial-and-error approach, anticipatory regulation is "proactive, forward-facing, flexible, iterative and more inclusive." It can be classified into three types of approach – advisory, adaptive and anticipatory. They all build on each other. The goal of advisory regulation is to help new products and services in adhering to existing regulations; adaptive regulation adapts new innovations to existing regulatory framework while anticipatory regulation develops interactive regulation and standards for an emerging field. The latter one enables regulators to deal with "more uncertainty, less evidence and a greater number of possible risks".[16] Foresight capabilities are processes of identifying opportunities and threats which may arise in mid- to long-term in the future. According to UNDP and the Global Center for Public Service Excellence, an effective foresight

---

[11] Kris Hammond, "What Is Artificial Intelligence?," Computerworld, April 10, 2015, https://www.computerworld.com/article/2906336/emerging-technology/what-is-artificial-intelligence.html.

[12] Kris Hammond, "What Is Artificial Intelligence?," Computerworld, April 10, 2015, https://www.computerworld.com/article/2906336/emerging-technology/what-is-artificial-intelligence.html.

[13] Summary of English Oxford Living Dictionary, Merriam-Webster Dictionary and Encyclopedia Britannica

[14] "OHCHR | Report of the Special Rapporteur to the General Assembly on AI and Its Impact on Freedom of Opinion and Expression," accessed December 9, 2018, https://www.ohchr.org/EN/Issues/FreedomOpinion/Pages/ReportGA73.aspx.

[15] Geoff Mulgan, "Anticipatory Regulation: 10 ways governments can better keep up with fast-changing industries," Nesta Foundation, accessed September 2, 2018, https://www.nesta.org.uk/blog/anticipatory-regulation-10-ways-governments-can-better-keep-up-with-fast-changing-industries/

[16] Harry Armstrong and Jen Rae, "A Working Model for Anticipatory Regulation: A Working Paper," nesta, accessed December 22, 2018, https://www.nesta.org.uk/report/a-working-model-for-anticipatory-regulation-a-working-paper/.

system consist of collecting information, interpreting the data and developing strategic options for future actions.[17]

4 Emerging Good Practices

Even though there are not many countries with clear AI regulations, there are some good practice examples among the most advanced countries in the field. Most countries are focusing on foresight, research, infrastructure and development, rather than regulations and legislations. For now, they are rather enabling innovations in the field of AI than limiting its applications. This section will give an overview of national AI strategies that were developed by three countries listed among the top 10 world economies, although facing different challenges. Cases are differentiated based on the background they are mostly inclining to. Thus, selection of the United Kingdom is representing its long-term involvement in AI field as well as its well-settled economic growth on a global scale. The Republic of India being the second case was selected because of its aim to secure social inclusion & equity through utilizing AI applications. Lastly, the subchapter devoted to The People's Republic of China was chosen in order to evaluate its AI strategies, plans and proposed anticipatory capabilities.

4.1 United Kingdom: Economic Growth on a Global Scale

The United Kingdom was the first country to legally recognize a cyborg as a citizen. In 2004 the UK Passport Office refused to allow self-identified cyborg Neil Harbisson to appear with an electronic device on his head on a passport photo. Harbisson, who is color-blind, has an antenna permanently implanted into his skull, allowing him to experience colors via electromagnetic radiation.[18] While after weeks of back and forth, the Passport Office accepted Harbisson's photo, therefore recognizing his antenna not as a device but as a body part and consequently Harbisson as cyborg, future developments in medicine and technology could generate further questions about the "citizenship" of machine body parts.

The UK was not only the first country to set a precedent in recognizing machine implants as integral body parts. In the light of Brexit in March 2019, the UK will have to change its strategy in many policy areas, including but not limited to research and development or economic policy. The focus of the UK will shift from Europe to a more global scale of cooperation as the UK might no longer remain part of the European Single Market and therefore no longer profit from the freedom of movement of goods, capital, services and persons. In May 2018, the government's new *Industrial Strategy* recognized AI as one of the four main challenges the

---

[17] GPCSE & UNDP, "Foresight as a Strategic Long-Term Planning Tool for Developing Countries" (2014). http://www.undp.org/content/dam/undp/library/capacity-development/English/Singapore%20Centre/GPCSE_Foresight.pdf, accessed July 14, 2018.

[18] Madeleine Stix, "World's First Cyborg Wants to Hack Your Body," CNN, accessed September 30, 2018, https://www.cnn.com/2014/09/02/tech/innovation/cyborg-neil-harbisson-implant-antenna/index.html.

economy would face in the future.[19] Shortly after, the government published the *Artificial Intelligence Sector Deal,* a strategy to turn the UK into the world's most innovative economy by promoting the development and the adoption of AI in order to boost productivity and earning power.[20] However, open questions regarding trust, ethics, governance and algorithmic accountability were left unaddressed in the *AI Sector Deal.* The issue was raised by the Parliament's House of Lords Select Committee on Artificial Intelligence, calling for putting ethics in the center of innovation and development.[21] In order to ensure the safe development and applications of AI enabled systems in the UK, a new Centre for Data Ethics and Innovation was established in July 2018.[22]

4.1.1 Strategies, Key Objectives and Main Focus Areas

The United Kingdom could prove to be role model for a focus on economic development for mid-income countries in the field, because the *AI Sector Deal* identifies activities to promote the adoption and use of AI in the UK as well as recommendations for future implementation. Being built around five foundations - people, infrastructure, ideas, business environment, places - it aims to turn the UK into world's most innovative economy. Its general ambition is to attract domestic and global talents, secure development for infrastructure, provide modern environment for AI businesses while at the same time spread benefits of such prosperity across country and society[23].

The idea's foundation, among other things, seeks to raise the total investment in research and development to 2.4 percent by 2027 and to invest £725m in new programs at the intersection of academia, the research community, the industry and end users. Under the people foundation, the UK will develop new school curricula in the STEM area and develop new funds and fellowships in order to attract the best research talents in the field. The UK will also heavily invest in infrastructure to develop 5G mobile networks and superfast internet coverage. In the area of the business environment foundation, London intends to establish an AI council with representation from ministries, industry and academia. This council will coordinate partnerships between the government and industry and co-investments in the private sector. The places foundation's policies counts on investing over £1bn into digital infrastructure, securing that the whole UK is digitally connected along with supporting and investing in regional tech companies and startups that should help fulfil their ambitions and bring growth to disadvantaged regions.

---

[19] "The Grand Challenges," GOV.UK, accessed September 30, 2018, https://www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges.

[20] "Artificial Intelligence Sector Deal," GOV.UK, accessed September 30, 2018, https://www.gov.uk/government/publications/artificial-intelligence-sector-deal.

[21] Lords Select Committee, "UK Can Lead the Way on Ethical AI, Says Lords Committee - News from Parliament," UK Parliament, accessed June 18, 2018, https://www.parliament.uk/business/committees/committees-a-z/lords-select/ai-committee/news-parliament-2017/ai-report-published/.

[22] "Centre for Data Ethics and Innovation Consultation," GOV.UK, accessed September 30, 2018, https://www.gov.uk/government/consultations/consultation-on-the-centre-for-data-ethics-and-innovation/centre-for-data-ethics-and-innovation-consultation

[23] "Artificial Intelligence Sector Deal," GOV.UK, accessed September 2, 2018, https://www.gov.uk/government/publications/artificial-intelligence-sector-deal

4.1.2   Ethics and Human Rights Dimension

The above-mentioned differentiation into groups of policies, proves that the UK's AI strategy is one of the most advanced when it comes to complex economic development and progress in general. The government is clearly aiming at economic growth, local talent development, research and diminishing divides across the country. However, the initial strategy fails to address awaiting challenges for regulation that might come with the AI development. Their importance and recommendations are mentioned in the report of the Artificial Intelligence Committee[24], which was published in April 2018.

The AI Committee on the House of Lords welcomed the establishment of institutions and the plan to connect the various actors and stakeholders in the field of AI -- academia, research community, industry, startups, civil society, and end users. However, the Committee report also cautions the government and decision makers to clearly lay out the roles, responsibilities and guidelines for collaboration and coordination for new and already existing institutions for researching, developing and regulating AI.[25]

Furthermore, the House of Lords Select Committee on Artificial Intelligence concluded that for now, a general AI-specific regulation would be inappropriate because new legislations often struggle to keep pace with the pace of change in technology. Rather they recommended that existing legislation should be applied to AI and other emerging technologies. As an example the report mentions the GDPR and UK-specific regulations on data protection that already cover most concerns regarding the handling of personal data. However many private companies and organizations in the UK are already designing their own internal ethical guidelines for developing and using AI . Many of the companies are operating internationally, but there has been little coordination among companies on a national level. The Committee recommends that the government should step in and flag our basic principles for AI codes as well as provide guidance.[26]

4.1.3   Economic and Sustainable Development Implications

The apart from planning to foster economic growth, applying existing and developing new regulations, the UK is also attempting to foster cooperation on a global scale. In August 2018, the UK's Financial Conduct Authority (FCA) announced the creation of Global Financial Innovation Network (GFIN), a "global sandbox," where companies can test one new fintech product in multiple countries at the same time.[27] In general, a regulatory sandbox allows companies to test newly developed technologies in a safe environment where they can also interact with regulators on a local or national level. This reduces the time and cost of getting new

---

[24] "AI in the UK: ready, willing and able?", PARLIAMENT.UK, accessed September 2, 2018, https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf

[25] ibid., p. 110f.

[26] ibid., p. 116.

[27] "FCA Collaborates on New Consultation to Explore the Opportunities of a Global Financial Innovation Network," FCA, August 6, 2018, https://www.fca.org.uk/news/press-releases/fca-collaborates-new-consultation-explore-opportunities-global-financial-innovation-network.

products to the market, allows startups to raise funding and helps regulatory authorities to stay on top of tech progress. The new GFIN sandbox now has the advantage that regulators and companies alike can share ideas and policies not only across sectors but also across national borders.[28]

4.1.4 Emerging Principles

What are the lessons that can be learned from the UK's strategies and policies in terms of regulatory practices for emerging technologies? First, the example of "cyborg" Neil Harbisson shows that sooner rather than later, the individual states and the international community - besides all other ethical concerns - will have to discuss a citizenship protocol for individuals with machine body parts. Second, rather than implementing new technology-specific legislations that might not be able to stay on top of development, states might want to think about how to effectively execute already existing regulations and provide the means necessary for this. Third, regulatory sandboxes as a cooperation not only across businesses and regulatory institutions in one country but also across borders could become a fruitful model for exchanges.

4.2 India: Social Inclusion and Equity

Indian case of harnessing technologies for a greater good is an example of a thorny path. Nevertheless, as discussed in this section, India is one of those country examples with a great potential of utilizing artificial intelligence for diminishing differences among its population and bringing prosperity.

4.2.1 Strategies, Key Objectives, Main Focus Areas

One of the most advanced concepts in the area of social inclusion and the utilization of AI, in order to create benefits for all citizens, can be illustrated by the *Indian National Strategy*.[29] The strategy was published in June 2018 by the governmental think tank National Institution for Transforming India, which was commissioned by the Indian Finance Minister Arun Jaitley.[30] It was branded as #AIforAll, aimed at empowering Indians with significant skills to find quality jobs, increasing investment in research and maximizing the social impact of AI development. In order to achieve this aim a two-tiered structure will be proposed. The Centre of Research Excellence (CORE) will focus on development of existing core research, while International Centers of Transformational AI (ICTAI) will develop and deploy application-based research and promote cooperation with private sector.[31] Focusing to generate quantifiable social impact in the

[28] Caroline Binham, "Regulators Club Together to Form Global 'Fintech Sandbox,'" Financial Times, August 7, 2018, https://www.ft.com/content/ae6a1186-9a2f-11e8-9702-5946bae86e6d.

[29] "National Strategy for Artificial Intelligence", GOV.IN, accessed September 29, 2018 http://niti.gov.in/writereaddata/files/document_publication/NationalStrategy-for-AI-Discussion-Paper.pdf

[30] "NITI Aayog releases strategy on artificial intelligence, identifies 5 focus areas", INDIATIMES.COM, accessed September 29, 2018 https://indianexpress.com/article/business/budget/budget-2018-arun-jaitley-speech-full-text-5047713/

[31] "NITI Aayog Releases Paper For India's Strategy On AI, Identifies 5 Core Areas", ANALYTICSINDIAMAG.COM, Accessed October, 26, 2018

medium to long-term, it addresses five sectors healthcare, agriculture, education, smart cities and transportation.

The healthcare sector aims to pursue universal health coverage in India. This should be driven by developing solutions supporting early detection of diseases, diagnostics, decision-making and treatment. The establishment of a National eHealth Authority might be perceived as redundant, since in many countries it is the Ministry of Health dealing with the adoption and maintenance of eHealth. However, the divides in quality and accessibility of healthcare across India should not be underestimated when speaking of establishing new policies. This applies also to the Electronic Health Record Standards for India that should be facilitated by the Integrated Health Information Program.

Regarding agriculture, India still suffers from a weak supply chain, poor resource utilization and low productivity. Thus, new policies will focus on improving crop yields through real time advisory, using for example soil health monitoring that will allow farmers to make decisions based on the analysis of image recognition apps. Furthermore, the intention to provide weather based advisory to farmers in order to utilize the data for crop health monitoring and advisory for sowing or pest control is also one of the good examples that might help Indian farmers. In the education sector, policies will pursue an impact in schools by securing decentralized teaching mechanisms working on cooperation with the private sector and educational institutions. This could bring new managing, tutoring and learning systems to the classroom. Also, predictive tools are expected to identify at-risk students, mainly those who are likely to dropout.

Smart cities and infrastructure are expected to gain greatly from the AI applications. Here, AI is projected to increase efficiency and connectivity for the growing urban population. Applications include maintenance and monitoring of streets and parks, producing cost savings and securing safety, or developing a new traffic control system and tools for enhanced crowd management. Such system is expected to optimize signal timings at the intersection, zonal and network level, while tools for crowd management are inspired by the Singapore Government that developed solution on predicting crowd behavior and potential responses to incidents during huge events, emergency and disasters.

Lastly the fifth sector mentioned in the strategy presents policies for smart mobility and transportation. Several AI applications are projected to facilitate transportation of Indian citizens. These include intelligent transportation systems, travel flow optimization and railways monitoring are expected to bring faster, safer and smarter types of transportation. To mention some, in this case India is counting on sensors, CCTV cameras, automatic number plate recognition cameras, speed detection cameras, signalized pedestrian crossings and stop line violation detection systems. As for real time dynamic travel flow optimization, the strategy introduces lane monitoring, access to exits, toll pricing, right of way to public transport vehicles or enforcing traffic regulations through smart ticketing as potential enhancements.

https://www.analyticsindiamag.com/niti-aayog-paper-india-strategy-ai-5-core-areas/

4.2.2 Ethics and Human Rights Dimension

As any other innovative, freshly established policies might be a target for misuse and vulnerability, so it is the Indian AI strategy. The strategy therefore devotes a whole chapter to the topics of misuse and vulnerability, in which concrete frameworks, benchmarks, laws or international standards are mentioned. Regarding ethics and AI, the strategy mentions possible bias on data-driven decision making systems. The fairness issue may occur at any point as it is based on existing data that may have bias from the beginning or which may have been reinforced. The key to challenge this is according to the text to identify in-built biases and assessment of their impact which may reduce the bias. This is a fair point, however AI application in real world are far from making autonomous decisions without any human involvement in the process. Creating an algorithm to counter possible bias in data will bear the same problem as well as human involvement might do. The text also addresses so called "Black Box Phenomenon", meaning the issue of processual transparency behind the desired result of AI system. The issue is defined through AI systems that are being improved in order to effectively achieve the result for which it is created. Therefore, the strategy calls for transparency rather than technical disclosure, which should be subjected to broader discussions and collaborative research. Certainly, AI systems working with private data must be regulated to the extent that authorities will be able to control them in case of misuse.

Privacy is highly sensible topic in relation to AI. There are almost daily leaks of private information, emails, photos or anything else that are used illegally at the expense of the aggrieved person. Collecting, processing and outcome generating of data must be secure and prepared for any violation. For this reason the Justice Srikrishna Committee is working on data protection law that should establish a framework with core principles such as informed consent, data controller accountability or deterrent penalties. Another example concerning privacy issue is the establishment of sectoral regulatory frameworks. These are expected to provide additional protection to user privacy and security. However, the strategy fails to address it deeper on the issue of data collection, processing and transferring. Apart from the above mentioned frameworks, the strategy is lacking enforceable policies that will counter vulnerabilities caused by AI applications. Encouraging AI developers to adhere to international standards, self-regulation via assessment tools or spreading awareness and investing in privacy preserving AI research is simply not enough. For a fast emerging field as AI, these policies will hardly provide enough protection to its citizens. There should be considerably more work done from the legal perspective that, as it is mentioned, might be benchmarked with international standards for example the European Union's General Data Protection Regulation.

4.2.3 Economic and Sustainable Development Implications

Implementing AI applications in order to utilize the benefits for such diverse population will not be an easy task for the Indian government. One of the toughest challenges that lays ahead the plan is the readiness of the workforce. Saran and Sharan assessed that "only around a quarter of the workforce aged 19 to 24 have achieved 'secondary' and 'higher secondary' education, and

close to 13 percent are illiterate".[32] The growth of unemployment due to automation is projected to be countered by re-skilling of the current workforce, building new platforms for improved learning and transition of education in primary and secondary schools towards the AI.[33] This is supported by the fact that only 4% of AI professionals in India have worked on cutting-edge technologies like deep learning and neural networks.[34] The reasons point at the lack of research and innovation focused engineers as well as on the brain drain.[35] Besides, Indian government will seek to secure universal health coverage, strengthen supply chain and resource utilization in agriculture or increase connectivity for the growing urban population.

4.2.4 Emerging Principles

One of the key lessons learned from the Indian case is its general aim focusing on creating an environment that is oriented on diminishing differences across whole country. Being fastly developing economy bears with it a great burden of vulnerability that must be properly addressed, especially in the field of AI. India in its strategy had developed good practices such as establishment of electronic health records accessible via Integrated Health Information Program or soil health monitoring and restoration mechanisms enabling farmers to have immediate data for anticipation or reaction. Other important good practice policies can be identified in the transport sector where travel flow optimization will be challenged by proposed artificial traffic control systems or crowd management monitoring, predicting its behavior and responses. Overall, the strategy demonstrates some good ideas when taking advantage of AI applications. As for the anticipation a good point raised is describing "Black Box Phenomenon" calling for processual transparency behind desired effect made by AI technology. This instance is focusing on rationale behind all steps taken prior to achieving its goal. Nevertheless, as it was already outlined, it lacks deeper examination of potential vulnerabilities and follow-up actions that might come with it.

4.3 China: Regulation and Foresight

In the recent decade China has emerged as an ambitious power to lead AI field. For that, it has been developing foresight capability researches and regulatory frameworks for AI, as well as investing largely in the field. However, whether China manages to meet its ambitions stays the

---

[32] Samir Saran and Vivan Sharan, "The Future of the Indian Workforce: A New Approach for the New Economy," *ORF*, March 21, 2018, https://www.orfonline.org/research/the-future-of-the-indian-workforce-a-new-approach-for-the-new-economy/.

[33] "National Strategy for Artificial Intelligence", GOV.IN, accessed September 29, 2018 http://niti.gov.in/writereaddata/files/document_publication/NationalStrategy-for-AI-Discussion-Paper.pdf

[34] Itika Sharma Punit, "Indian Engineers Need to Stop Being so Afraid of the Term 'Artificial Intelligence,'" Quartz India, accessed December 22, 2018, https://qz.com/india/911261/indian-engineers-need-to-stop-being-so-afraid-of-the-words-artificial-intelligence/.

[35] "Indian engineers need to stop being so afraid of the term "artificial intelligence", QZ.COM accessed October 26, 2018 " https://qz.com/india/911261/indian-engineers-need-to-stop-being-so-afraid-of-the-words-artificial-intelligence/

question of a time. Currently, declining tendencies are visible in terms of investment attractions and AI technology development itself.

4.3.1   Strategies and Key Objectives, Main Focus Areas

In July 2017, the State Council of China released the *New Generation Artificial Intelligence Development Plan.* This was the official presentation of China's ambitions to develop the AI sector as a national priority and become a world leader in the AI field in the following decades. The plan divides China's AI goals into three "Strategic Objectives" to be met by 2020, 2025, and 2030. According to the Plan, by 2020, China aims to reach global standards with important achievements in the field. By 2025 China will begin to establish AI laws and regulations and by 2030 China plans to become the world's AI leader with its core industry exceeding one trillion yuan (144.7 billion USD).

The Plan encourages progress in key areas such as autonomous vehicles, service robots, voice interactive systems, assistance systems for diagnostic imaging, video and image identification systems, intelligent translation systems, and smart home products. It also encourages development of core technologies, including intelligent sensors, neural network chips, and open source platforms. Finally, the Action Plan calls on the government and the financial industry to support AI initiatives.[36]

While other countries are also dedicated to support AI innovation, none of them is as comprehensive as China and capable of getting things done. According to Greg Williams, the Chinese government can implement policies which are not possible for Western democracies.[37] However, according to Xiaomeng Lu, an international public policy manager for the technology consultancy Access Partnership, it will remain a challenge for China to achieve this level of development and innovation over the next decade. One of the deadlocks this process generates is the restriction on the access of government data. This limits AI researchers which need to have lots of data for their model trainings. "The policy makers have to work with the private sector players to make these things happen," Lu added.[38]

Technology foresight has also received increasing attention among scholars and policy makers in China[39]. This interest dates back to previous century, from 1998 to 2001 Chinese journal articles about technology foresight were gradually, but slowly, increasing. Moreover, The Ministry of Science and Technology (MOST) organized and implemented critical national technology selection in 1992 to 1995, and 24 critical technologies were chosen from the fields of information, biology, manufacturing, and material. The MOST and other institutions also conducted foresight activities in 1997-1999 for the development of technology in three key fields:

---

[36] Theodore J. Karch, Ashwin Kaja, and Yan Luo, "China's Vision for The Next Generation of Artificial Intelligence," The National Law Review, March 25, 2018, https://www.natlawreview.com/article/china-s-vision-next-generation-artificial-intelligence.

[37] Greg Williams, "Why China Will Win the Global Race for Complete AI Dominance," *Wired UK*, April 16, 2018, https://www.wired.co.uk/article/why-china-will-win-the-global-battle-for-ai-dominance.

[38] George Leopold, "China Ahead on AI Strategy, Behind on Data Access," Datanami, July 30, 2018, https://www.datanami.com/2018/07/30/china-ahead-on-ai-strategy-behind-on-data-access/.

[39] Na Li, Kaihua Chen, and Mingting Kou, "Technology Foresight in China: Academic Studies, Governmental Practices and Policy Applications," *Technological Forecasting and Social Change* 119 (June 1, 2017): 246–55, https://doi.org/10.1016/j.techfore.2016.08.010.

agriculture, information, and advanced manufacturing. The results for these kind of foresight activities were usually employed in "Five-Year S&T planning."

At the turn of the century, China's foresight activities dramatically increased. The Institute of Policy and Management (IPM) under the Chinese Academy of Sciences (CAS) conducted a program from 2003 to 2005 for "Technology Foresight Toward 2020 China" based on in-depth analysis, description of major science and researching on technology demands for building prosperous society. This was accomplished by scenario analyses, a large-scale Delphi survey[40] and expert panels. A new stage - maturation period - started from 2009 and until 2013 processes cooled down. However, since 2013 large-scale processes have begun and China became more concerned to solve societal challenges with innovation. Methodology and processes itself also became more mature.

4.3.2   Human Rights & Ethics Dimension

China's AI development plan poses two other goals as well. One, that AI research can be open source for inspection and collaboration. This principle calls for joint actions - innovation and sharing - between industry, academia, research and production units. And second, to develop an ethical code of conduct and "strengthen the assessment of the potential hazards and benefits of AI."[41]

China's efforts in ethical and human rights issues are already present in the government's strategy. On June 1, 2017 China issued Cybersecurity Law. After its facial recognition system implementation, also issued new personal information protection standard, Personal Information Security Specification, in January 2018.[42] Cybersecurity Law comes with a handful of accompanying measures, and more than 10 draft standards that deal with both data flows and protection of personal information. The Personal Information Security Specification is the most comprehensive document to date for protection of personal information, which is one of six systems under the Cybersecurity Law. This Standard is under the fourth system, named "personal information and important data protection system."

While the drafters of the Standard relied heavily on the GDPR, they tried to make it more adaptive for China, namely, they claim it is more "business friendly" in order not to hamper development of AI. The major examples for differences lie in the changed definition of consent and the conditions of exemptions from the consent. In GDPR consent is determined as only explicit but no implied. It must be a clear statement of the party (signature, checking a box). In contrast, Chinese standard comes here with more flexibility as it allows for 'implied or silent' consent in certain instances.

---

[40] Investopedia: The Delphi method is a forecasting process framework based on the results of several rounds of questionnaires sent to a panel of experts. Several rounds of questionnaires are sent out, and the anonymous responses are aggregated and shared with the group after each round.

[41] Zulfikar Abbany, "Who's Afraid of Artificial Intelligence in China?," Deutsche Welle, September 18, 2018, https://www.dw.com/en/whos-afraid-of-artificial-intelligence-in-china/a-45546972.

[42] Yan Luo and Phil Bradley-Schmieg, "China Issues New Personal Information Protection Standard," Inside Privacy, January 25, 2018, https://www.insideprivacy.com/international/china/china-issues-new-personal-information-protection-standard/.

According to Standardization Law, the standards shall contain national (comprising mandatory and recommended standards), industry and enterprise, local and community level standards. The Specification is rather a recommended national standard than a mandatory one, meaning that inconsistency with it does not necessarily constitute violation of relevant laws and regulations. However, the national standardization system adheres to the principle of "mandatory as threshold, recommended for general practices, enterprise for strengthening quality". This makes specifications an universal standard for enterprises. Hence, although recommended national standards having non-binding nature, they may still be referred while enforcement of binding regulations.

Though, China's human rights approach in practice remains under question. Citizens' mass surveillance program, known as the "social credit system," first announced in 2014 aims to give all of its 1.4 billion citizens a personal score based on their behavior by 2020. These scores could affect whether one can buy a flight ticket, own or rent a house or get a loan and so on. The scores are generated by facial recognition systems, smart glasses or other AI technologies[43] including innovative drones. In recent years more than 30 military and government agencies have deployed the birdlike drones and related devices in at least five provinces of China. Most extensively it is used in Xinjiang Uygur autonomous region in China's far west.[44] This minority region is heavily policed because of its separatist tendencies and the risk of terrorism as claimed by the government.[45]

4.3.3 Economic, Sustainable Development implications

China's One Belt One Road (OBOR) project comes hand in hand with its ambitious goals to intertwine technological and economic leadership. OBOR's aim is to establish the world's largest platform for economic cooperation, for that, "Digital Silk Road" is envisioned as another significant facet of OBOR.[46] Wang Huiyao, founder and president of Centre for China and Globalisation (CCG), said: "There has always been the question: What will China export via the Digital Silk Road? The answer has long been evident: a digital economic infrastructure that will allow China's technological powers to go global."[47] China established strategies for enterprises and businesses to support them develop in multiple ways.[48]

China's efforts farther go to investing billions of dollars in infrastructure to locate hundreds of AI related businesses in special industrial parks, promotes particular companies, Chinese

---

[43] Myers, M.2018 *China turns to tech to monitor, shame and rate citizens*, Accessed on December 20, 2018 https://www.cnet.com/news/china-turns-to-tech-to-monitor-shame-and-rate-citizens/

[44] Chen, S. 2018 *China's Robo-Bird Drones Take Citizen Surveillance To New Heights* Accessed on December 20, 2018 https://www.technocracy.news/chinas-robo-bird-drones-take-citizen-surveillance-to-new-heights/

[45] 'The Guardian, 2018, *We're a people destroyed': why Uighur Muslims across China are living in fear* Accessed December, 20, 2018 https://www.theguardian.com/news/2018/aug/07/why-uighur-muslims-across-china-are-living-in-fear

[46] Tian Jinchen, "*One Belt and One Road': Connecting China and the World*" accessed December 22, 2018, https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/one-belt-and-one-road-connecting-china-and-the-world.

[47] "One Belt, One Road: China Heralds 'Digital Silk Road'," *CCG - Center for China and Globalization*, December 7, 2017, http://en.ccg.org.cn/one-belt-one-road-china-heralds-digital-silk-road/.

[48] See footnote 37.

counterparts of Google or Amazon. China also makes it compulsory for citizens and businesses to share their data with the government.

Education is another facet China focuses on, in order to get more STEM workers.[49] And while Western countries seem to be worried about AI that it can eliminate jobs and worsen inequality, China has quite opposite beliefs.[50] For them AI is the promise of great opportunities – while it can eliminate many low-skilled manual and administrative jobs, it has the huge potential for more efficient and productive industries.

4.3.4   Emerging Good Principles

China, in general, can become the good example of getting 'inspiration' from others' approach, in this case GDPR, and adopt it to their own needs and approaches. Although, the particular practice of changing fundamental concepts, such as consent, may not be the promising indicator for personal data protection for Western societies, China can make use of it for its needs in particular context - technological advancement.

China's efforts to involve every kind of stakeholders in the whole disruption process, including governmental bodies, businesses, academics, regulators, experts, gives clear picture that for each and every country, it is vital not to leave everything to regulators only and give platform for other bodies for engagement.

Positive attitude towards AI and realization of its importance for the future is another good example China gives to other countries. Certainly, AI has huge potentials in all aspects of our lives and China is ambitious to harness those potentials by heavy investments and prioritization of the field.

5   Policy Recommendations and Conclusion

The potential AI can generate for the human development is highly promising, however, it bears the risks of damage to humans unless treated carefully. It is no longer question, whether to regulate implementation of AI or not, rather the question is, what kind of frameworks national governments and international organizations can come up with in order to harness AI's greatest potential without damage to societies, economies, governments or individuals. Whether it is anticipatory regulations, performance standards or existing regulations adapted to technologies, new approaches and frameworks are of a highest necessity, not in the long future, not in a few decades but today. While some national governments have already demonstrated attempts to deal with regulatory necessities generated by emerging technologies, international organizations play

---

[49] Tristan Greene, "China Set to Leapfrog US in the AI Race," The Next Web, July 30, 2018, https://thenextweb.com/artificial-intelligence/2018/07/30/china-set-to-leapfrog-us-in-the-ai-race/?utm_campaign=OGshare.

[50] Will Knight, "China's AI Awakening," MIT Technology Review, October 10, 2017, https://www.technologyreview.com/s/609038/chinas-ai-awakening/.

their part as well, their importance is most relevant for mid- and low-income countries which are at risk to lag behind the technological developments not only in terms of regulations but also harnessing for sustainable development.

In the case of the UK, rather than creating a new one-size-fits-all regulation for AI that might already be outdated once it enters into force, the Parliament's Lord Select Committee recommended to evaluate already existing legislations regarding their applicability to emerging technologies. Furthermore, the UK is trying to foster international cooperation in the field of emerging technologies and anticipatory regulation by creating a "global sandbox" that will not only allow exchanges between companies, regulators and lawmakers on a national but on an international level. Participating in an international network of companies, regulators and lawmakers might be especially beneficial for mid- and low- income countries.

India is taking an approach where the benefits of AI will be used to diminish socio-economic divides across the whole country. The plan is to employ AI in the public health sector, agriculture, transportation, among others. As the most populous democracy in the world, India is facing unique challenges in terms of corruption, poverty, malnourishment and healthcare. Therefore, its AI strategy is remarkable for its inclusivity and its vision to harness it in order to bring the whole country forward. Mid- and low-income countries might especially benefit from taking such a holistic approach that aims at bridging socio-economic divides. Another policy from the strategy that might be beneficial for mid- and low-income countries is India's call for algorithmic and processual transparency. Transparency could help prevent unintended consequences when new technologies are implemented without an appropriate regulatory framework.

China can freely be named as a very distinct case both for regulations and AI development strategies. While heavy investments and ambitions to lead the world in AI field cannot be the practical examples for mid- or low-income countries, the regulatory approaches can be useful. Although GDPR has been the 'inspiration' for China's data protection strategy, there are major differences between them, for instance, China gives more freedom to businesses. This serves the purpose of China to unleash the opportunities of AI and meet its plan to become the AI world leader. China also proves that cooperation and coordination among different stakeholders is of highest importance as well for the development of foresight capabilities and new approaches to regulations.

Hence, UK, India and China are some of the good practice examples from AI world players, however with quite different approaches and strategies. The common ground they all display is that the neither regulations, nor strategies for development can be universal for all the countries across the world. It needs wider discussions among all sectors of society including governments, legislators, businesses, academics, civil society inside the country to work out frameworks compatible for their specific context and necessities. Even though each and every country do not need to create their own regulations from scratch, it is still irrational and even impossible to import existing approaches without adopting it to own needs. It is vital for mid- and low-income countries to create their own ground - institutions, bodies, groups of field experts - to import existing frameworks, implement and execute them.

6   Bibliography

Abbany, Zulfikar. "Who's Afraid of Artificial Intelligence in China?" Deutsche Welle, September 18, 2018. https://www.dw.com/en/whos-afraid-of-artificial-intelligence-in-china/a-45546972.

Armstrong, Harry, and Jen Rae. "A Working Model for Anticipatory Regulation: A Working Paper." nesta. Accessed December 22, 2018. https://www.nesta.org.uk/report/a-working-model-for-anticipatory-regulation-a-working-paper/.

"Artificial Intelligence at the Service of the Citizen — AI White Paper Draft Documentation." Accessed October 27, 2018. https://ai-white-paper.readthedocs.io/en/latest/.

"Artificial Intelligence Sector Deal." GOV.UK. Accessed September 30, 2018. https://www.gov.uk/government/publications/artificial-intelligence-sector-deal.

Begovic, Milica, Opruneco, Alex, and Sadiku, Lejla. "Let's Talk about Artificial Intelligence." UNDP Blog. Accessed June 18, 2018. http://www.undp.org/content/undp/en/home/blog/2018/let_s-talk-about-artificial-intelligence.html.

Binham, Caroline. "Regulators Club Together to Form Global 'Fintech Sandbox.'" Financial Times, August 7, 2018. https://www.ft.com/content/ae6a1186-9a2f-11e8-9702-5946bae86e6d.

"Budget 2018: Government Seeks to Boost Australian AI Capabilities." Computerworld. Accessed October 27, 2018. https://www.computerworld.com.au/article/640926/budget-2018-government-seeks-boost-australian-ai-capabilities/.

"Centre for Data Ethics and Innovation Consultation." GOV.UK. Accessed September 30, 2018. https://www.gov.uk/government/consultations/consultation-on-the-centre-for-data-ethics-and-innovation/centre-for-data-ethics-and-innovation-consultation.

"China, Russia and the US Are in an Artificial Intelligence Arms Race." Futurism, September 12, 2017. https://futurism.com/china-russia-and-the-us-are-in-an-artificial-intelligence-arms-race.

CNN, Madeleine Stix. "World's First Cyborg Wants to Hack Your Body." CNN. Accessed September 30, 2018. https://www.cnn.com/2014/09/02/tech/innovation/cyborg-neil-harbisson-implant-antenna/index.html.

Chen, S. 2018 *China's Robo-Bird Drones Take Citizen Surveillance To New Heights* Accessed on December 20, 2018 https://www.technocracy.news/chinas-robo-bird-drones-take-citizen-surveillance-to-new-heights/

"Communication Artificial Intelligence for Europe." Digital Single Market. Accessed October 27, 2018. https://ec.europa.eu/digital-single-market/en/news/communication-artificial-intelligence-europe.

Datta, Bianca. "Can Government Keep Up with Artificial Intelligence?" PBS.org. Accessed December 22, 2018. https://www.pbs.org/wgbh/nova/article/ai-government-policy/.

Department of Industry, Innovation and Science. "Australia 2030: Prosperity through Innovation." Text. Department of Industry, Innovation and Science, May 16, 2018.

https://www.industry.gov.au/data-and-publications/australia-2030-prosperity-through-innovation.

EUR-Lex. "Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC (General Data Protection Regulation)." Accessed December 9, 2018. https://eur-lex.europa.eu/eli/reg/2016/679/2016-05-04.

"EUR-Lex - 52017PC0495 - EN - EUR-Lex." Accessed December 9, 2018. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2017%3A495%3AFIN.

European Commission. "EU Member States Sign up to Cooperate on Artificial Intelligence." Digital Single Market. Accessed June 18, 2018. https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-artificial-intelligence.

"FCA Collaborates on New Consultation to Explore the Opportunities of a Global Financial Innovation Network." FCA, August 6, 2018. https://www.fca.org.uk/news/press-releases/fca-collaborates-new-consultation-explore-opportunities-global-financial-innovation-network.

"Finland's Age of Artificial Intelligence: Turning Finland into a Leading Country in the Application of Artificial Intelligence." Ministry of Economic Affairs and Employment, n.d. http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160391/TEMrap_47_2017_verkkoju lkaisu.pdf?sequence=1&isAllowed=y.

"For a Meaningful Artificial Intelligence: Towards a French and European Strategy." AI for Humanity, n.d. https://www.aiforhumanity.fr/pdfs/MissionVillani_Report_ENG-VF.pdf.

Greene, Tristan. "China Set to Leapfrog US in the AI Race." The Next Web, July 30, 2018. https://thenextweb.com/artificial-intelligence/2018/07/30/china-set-to-leapfrog-us-in-the-ai-race/?utm_campaign=OGshare.

Hammond, Kris. "What Is Artificial Intelligence?" Computerworld, April 10, 2015. https://www.computerworld.com/article/2906336/emerging-technology/what-is-artificial-intelligence.html.

Haverman, Patrick. "The Safety of AI, the Future of Work and Universal Basic Income." UNDP in China. Accessed June 18, 2018. http://www.cn.undp.org/content/china/en/home/ourperspective/ourperspectivearticles/2018 /01/08/the-safety-of-ai-the-future-of-work-and-universal-basic-income.html.

"In AI, Russia Is Hustling to Catch Up." Defense One. Accessed October 27, 2018. https://www.defenseone.com/ideas/2018/04/russia-races-forward-ai-development/147178/.

Jinchen, Tian. "'One Belt and One Road': Connecting China and the World | McKinsey." Accessed December 22, 2018. https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/one-belt-and-one-road-connecting-china-and-the-world.

Karch, Theodore J., Ashwin Kaja, and Yan Luo. "China's Vision for The Next Generation of Artificial Intelligence." The National Law Review, March 25, 2018. https://www.natlawreview.com/article/china-s-vision-next-generation-artificial-intelligence.

Knight, Will. "China's AI Awakening." MIT Technology Review, October 10, 2017.
https://www.technologyreview.com/s/609038/chinas-ai-awakening/.

Leopold, George. "China Ahead on AI Strategy, Behind on Data Access." Datanami, July 30,
2018. https://www.datanami.com/2018/07/30/china-ahead-on-ai-strategy-behind-on-data-
access/.

Li, Na, Kaihua Chen, and Mingting Kou. "Technology Foresight in China: Academic Studies,
Governmental Practices and Policy Applications." *Technological Forecasting and Social Change* 119
(June 1, 2017): 246–55. https://doi.org/10.1016/j.techfore.2016.08.010.

Lords Select Committee. "UK Can Lead the Way on Ethical AI, Says Lords Committee - News
from Parliament." UK Parliament. Accessed June 18, 2018.
https://www.parliament.uk/business/committees/committees-a-z/lords-select/ai-
committee/news-parliament-2017/ai-report-published/.

Luo, Yan, and Phil Bradley-Schmieg. "China Issues New Personal Information Protection
Standard." Inside Privacy, January 25, 2018.
https://www.insideprivacy.com/international/china/china-issues-new-personal-information-
protection-standard/.

Maçães, Bruno. "Europe's AI Delusion." POLITICO, March 19, 2018.
https://www.politico.eu/article/opinion-europes-ai-delusion/.

Marr, Bernard. "The Key Definitions Of Artificial Intelligence (AI) That Explain Its
Importance." Forbes. Accessed December 22, 2018.
https://www.forbes.com/sites/bernardmarr/2018/02/14/the-key-definitions-of-artificial-
intelligence-ai-that-explain-its-importance/.

Mulgan, Geoff. "Anticipatory Regulation: 10 Ways Governments Can Better Keep up with Fast-
Changing Industries." nesta. Accessed December 22, 2018.
https://www.nesta.org.uk/blog/anticipatory-regulation-10-ways-governments-can-better-keep-
up-with-fast-changing-industries/

Myers, M. 2018 *China turns to tech to monitor, shame and rate citizens* Accessed on December 20, 2018
https://www.cnet.com/news/china-turns-to-tech-to-monitor-shame-and-rate-citizens/

Ning, Susan. "Analysis of the Personal Information Security Specification from a Practical
Perspective." China Law Insight, February 7, 2018.
https://www.chinalawinsight.com/2018/02/articles/corporate/antitrust-competition/the-wise-
and-informed-adapts-to-the-changing-time-and-circumstances-discussing-the-issues-on-
information-technology-personal-information-security-specification-from-a-pract/.

OHCHR. "Report of the Special Rapporteur on the Promotion and Protection of the Right to
Freedom of Opinion and Expression," 2018. http://undocs.org/A/73/348.

"OHCHR | A Call for a Moratorium on the Development and Use of Lethal Autonomous
Robots." Accessed December 9, 2018.
https://www.ohchr.org/en/newsevents/pages/acallforamoratoriumonthedevelopmentrobots.as
px.

"OHCHR | A Call for a Moratorium on the Development and Use of Lethal Autonomous Robots." Accessed December 9, 2018. https://www.ohchr.org/en/newsevents/pages/acallforamoratoriumonthedevelopmentrobots.aspx.

"OHCHR | Report of the Special Rapporteur to the General Assembly on AI and Its Impact on Freedom of Opinion and Expression." Accessed December 9, 2018. https://www.ohchr.org/EN/Issues/FreedomOpinion/Pages/ReportGA73.aspx.

"One Belt, One Road: China Heralds 'Digital Silk Road'." *CCG - Center for China and Globalization*, December 7, 2017. http://en.ccg.org.cn/one-belt-one-road-china-heralds-digital-silk-road/.

"Pan-Canadian Artificial Intelligence Strategy." CIFAR. Accessed October 27, 2018. https://www.cifar.ca/ai/pan-canadian-artificial-intelligence-strategy.

"Proposal for a Regulation of the European Parliament and of the Council on a Framework for the Free Flow of Non-Personal Data in the European Union (COM(2017)495)." Digital Single Market. Accessed December 9, 2018. https://ec.europa.eu/digital-single-market/en/news/proposal-regulation-european-parliament-and-council-framework-free-flow-non-personal-data.

Punit, Itika Sharma. "Indian Engineers Need to Stop Being so Afraid of the Term 'Artificial Intelligence.'" Quartz India. Accessed December 22, 2018. https://qz.com/india/911261/indian-engineers-need-to-stop-being-so-afraid-of-the-words-artificial-intelligence/.

Rajagopalan, Megha. "This Is What A 21st-Century Police State Really Looks Like." BuzzFeed News. Accessed December 22, 2018. https://www.buzzfeednews.com/article/meghara/the-police-state-of-the-future-is-already-here.

"Safeguarding Human Rights in the Era of Artificial Intelligence." Commissioner for Human Rights. Accessed December 9, 2018. https://www.coe.int/en/web/commissioner/blog/-/asset_publisher/xZ32OPEoxOkq/content/safeguarding-human-rights-in-the-era-of-artificial-intelligence.

Saran, Samir, and Vivan Sharan. "The Future of the Indian Workforce: A New Approach for the New Economy." *ORF*, March 21, 2018. https://www.orfonline.org/research/the-future-of-the-indian-workforce-a-new-approach-for-the-new-economy/.

"The Danish Government Presents 'Digital Growth Strategy.'" Invest In Denmark. Accessed October 27, 2018. https://investindk.com/insights/the-danish-government-presents-digital-growth-strategy.

"The Grand Challenges." GOV.UK. Accessed September 30, 2018. https://www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges.

'The Guardian, 2018, *We're a people destroyed': why Uighur Muslims across China are living in fear* Accessed December, 20, 2018 https://www.theguardian.com/news/2018/aug/07/why-uighur-muslims-across-china-are-living-in-fear

"UK Can Lead the Way on Ethical AI, Says Lords Committee - News from Parliament." UK
Parliament. Accessed October 10, 2018.
https://www.parliament.uk/business/committees/committees-a-z/lords-select/ai-
committee/news-parliament-2017/ai-report-published/.

"Why We Urgently Need a Digital Geneva Convention." World Economic Forum. Accessed
June 18, 2018. https://www.weforum.org/agenda/2017/12/why-we-urgently-need-a-digital-
geneva-convention/.

Williams, Greg. "Why China Will Win the Global Race for Complete AI Dominance." *Wired UK*,
April 16, 2018. https://www.wired.co.uk/article/why-china-will-win-the-global-battle-for-ai-
dominance.

World Governnment Summit. "Reg-Tech for Regulators: Re-Architect the System for Better
Regulation." Accessed June 18, 2018.
https://www.worldgovernmentsummit.org/api/publications/document?id=5ccf8ac4-e97c-6578-
b2f8-ff0000a7ddb6