

EMERGING TECHNOLOGIES TRENDS 2020 : AI AND BIG DATA FOR DEVELOPMENT 4.0

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MAIN OBJECTIVE OF THE REPORT

- This report has been designed to help developing countries embrace the opportunities offered by AI and big data deployment, to highlight the main challenges and to offer hands-on suggestions for regulators and policy-makers. Drawing on case studies and initiatives in four domains of AI and big data application (health, mobile big data, agriculture, education and open data), this report describes how developing countries can benefit from the identification and implementation of adequate big data and AI technologies, the removal of regulatory and policy barriers and the incentivization of AI and big data uptake. It illustrates the significance of these opportunities and outlines good policy and regulatory practices to ensure that they are properly seized.
- The report asks the main questions that need to be answered to harness the power of AI and big data for development:
 - What are the main opportunities and challenges, and why is addressing them important?
 - How do we address these challenges and bring the opportunities offered by AI and big data within the reach of developing countries?
 - Who are the main stakeholders that can help in reaping the benefits of AI and big data for development?

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CHAPTER 1

BIG DATA AND AI ARE CHANGING THE DEVELOPMENT PARADIGM

Fundamentals of big data and AI

- Definition of AI
- Definition of big data
- Big data volume
- Big data velocity
- Big data veracity
- Big data variety
- Data classification (types and sources)
- Data labeling
- Data mining

Types of big data for development

- Structured
- Semi-structured
- Unstructured
- Metadata
- Data exhaust
- Human sourced (citizen-generated) data
- AI sourced data
- Personal data
- Non-personal data
- Open data

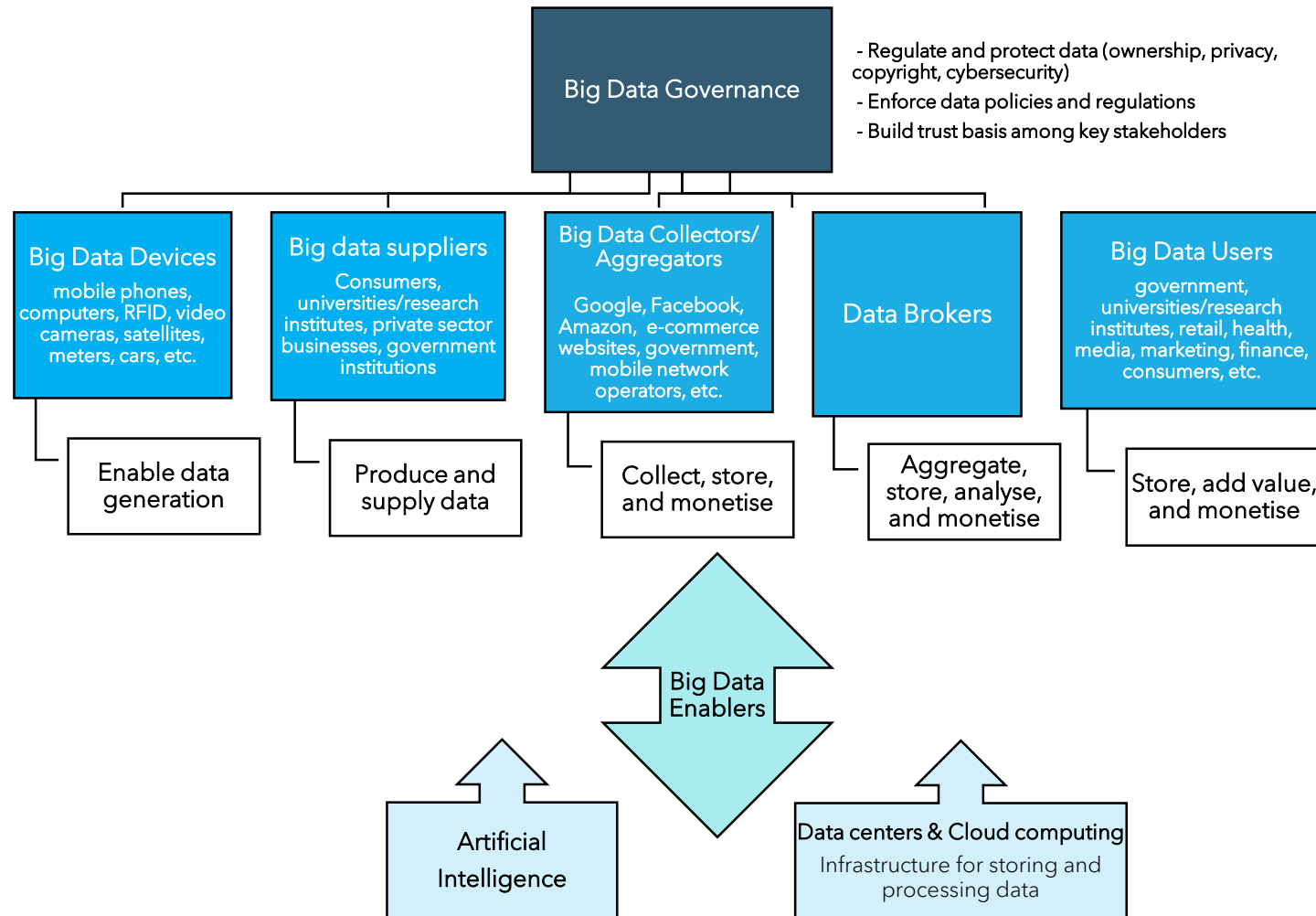
Main elements of data infrastructure

- Big data devices
- Big data suppliers
- Big data collectors/aggregators
- Data brokers
- Big data users
- Big data governance
- Big data enablers (AI and data centers/cloud computing)

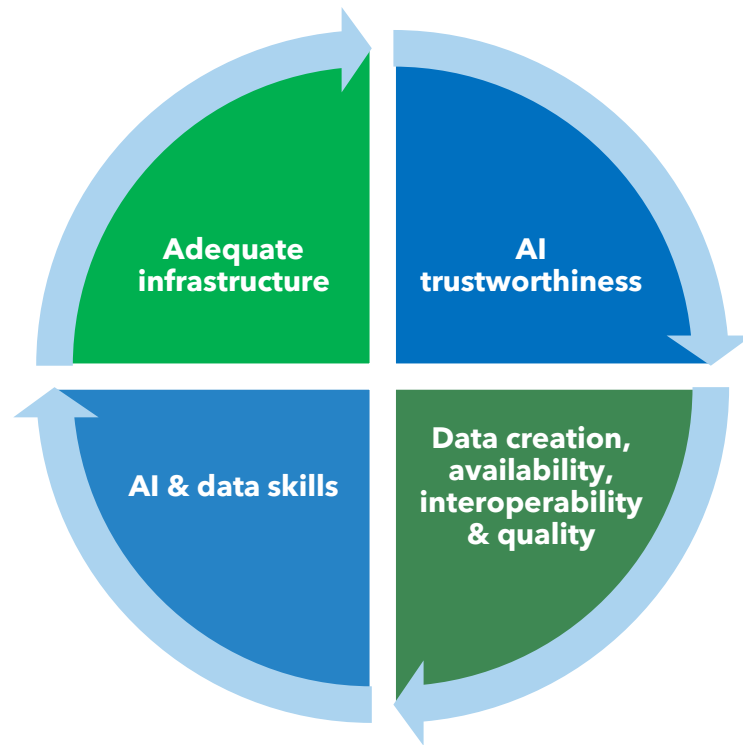
Key challenges in leveraging big data and AI for development

- Data creation, availability, interoperability, and quality
- AI and data skills
- Adequate infrastructure
- AI trustworthiness
 - Fair and unbiased AI
 - Transparent and explainable AI
 - Responsible and accountable AI
 - Robust and reliable AI
 - Privacy compliant AI
 - Safe and secure AI
 - Diverse and inclusive AI
 - Human centered AI

I.3. MAIN ELEMENTS OF DATA INFRASTRUCTURE



I.4. KEY CHALLENGES IN LEVERAGING BIG DATA AND AI FOR DEVELOPMENT



- **The AI and data revolution has not yielded dividends for most developing countries.** Often, these countries lack the prerequisites (reliable ICT infrastructure, reliable access to electricity, human capital and regulatory framework) to collect sufficient data to utilize AI algorithms for development. Too often, existing data remain unused because they are released too late or not at all, are not available in digital format or are not at the level of detail needed for decision-making or local innovation.

DATA CREATION, AVAILABILITY, INTEROPERABILITY AND QUALITY

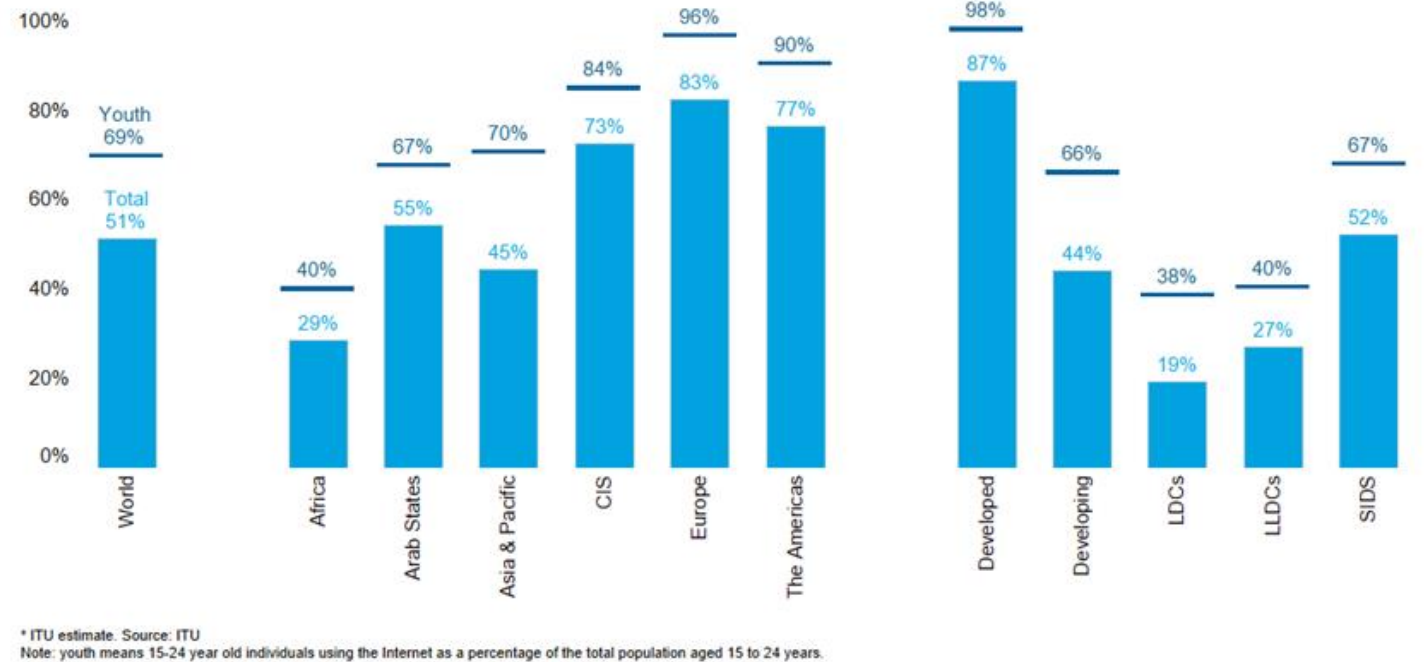
- **Developing countries have low levels of “datafication,”** making the issue of data creation and data digitization particularly significant. This would include the digitization of existing files, knowledge and information and creating new digital data by digitalizing services in health care, education, social security, etc.
- **Even when digitized, data in many developing countries are not shared and made available as widely as in other parts of the world.** To be useful, data must be high quality, appropriately disaggregated and available and accessible to data users. Data are an inexhaustible resource and their value lies in their use and reuse. The more that the data are shared and used, the more valuable the data become.
- For data to be useful, they must be accessible, timely, high quality and relevant to local contexts. Currently, many developing countries lack such data. To overcome this challenge and gain a contextual understanding of issues, **policy-makers need to make data more pervasive and granular by implementing a coordinated cross-sector approach involving increasingly regular data collection and publication, while encouraging the use of open public data and delivering services using open APIs.** Moreover, data interoperability, structure, authenticity and integrity are key to exploiting value from data, particularly in the context of AI deployment.

AI AND DATA SKILLS

- AI and data skills are required for the effective deployment of AI and big data. Hence, it is important that there is a link between research institutes and training centres on the one hand and tech hubs, corporate research departments and entrepreneurs on the other in order to ensure that new AI developments find their way to the market and are deployed on the ground. **A data skill shortage may be the most serious systemic factor holding back data-based innovation and productivity in many developing countries.** This shortage is something that governments across the globe must work to mitigate quickly.
- Employers expect more than 40 % of skills required for the workforce of the future to change by 2022 and 65 per cent of children to find employment in a job that does not yet exist (WEF 2018)
- In a survey of young people in Arab countries, 78 % of respondents were concerned about the quality of education in 2019. Adding to this problem is the fact that few women in the region pursue careers in STEM and that the gender gap in Internet use increased from 19.2 % in 2013 to 24.4 % in 2019.
- Sub-Saharan Africa is the world region with the lowest score in the percentage of total labor force that uses LinkedIn (4 %) and in terms of level of digital skills, with about half the average global level of digital skill adoption or “relative penetration,” which had been normalized to a value of 1.0 for a global average. Thus, while Africa has the fastest growing youth population, its workforce has the lowest overall skill base in the world (World Bank 2020)
- Similarly, companies in the Middle East are facing challenges in finding skills that support big data and analytics deployment, having to rely heavily on partners for support until solutions go into production.

ADEQUATE INFRASTRUCTURE

- Having adequate infrastructure, i.e. access to electricity and ICT and transport infrastructure, is fundamental to the deployment of big data and AI for development.
- Limited and costly access to electricity, insufficient national and international connectivity, difficulties in the roll-out of terrestrial communication infrastructure across large land areas, especially in rural and remote areas, large amounts of data being private and not open and unequal access to data are all impediments to the successful deployment of big data for development.



Percentage of individuals using the Internet, 2019,
source: ITU

AI TRUSTWORTHINESS

- **AI should be fair and unbiased.** Algorithmic bias, which implies that AI is only as good as the data on which it is trained, is an important factor in how AI and big data are used for development. It has a more pronounced effect when AI applications are introduced to the context of developing countries.
- **AI should be transparent and explainable.** In order to reap the benefits of AI for development, all participants should have the right to understand how their data are used. AI algorithms must be open to inspection, and their decisions must be fully explainable.
- **AI should be responsible and accountable.** Trustworthy AI systems need to have policies that clearly identify who is responsible and accountable for AI output.
- **AI should be robust and reliable.** AI must be at least as robust and reliable as the traditional systems, processes and people it is augmenting or replacing. This means that AI must be available when it is supposed to be and must generate consistent and reliable outputs even in less than ideal circumstances.
- **AI should be privacy compliant.** Privacy protection is critical for all data systems, but especially so for AI because the insights generated by AI rely on data that are often personal in nature. The issue of privacy protection is more complex in developing countries as, more often than not, such countries do not have sufficient resources to draft and implement robust cybersecurity and privacy-compliant AI systems.
- **AI should be safe and secure.** AI systems should be safe and secure so that the data on which they are trained cannot be tampered with or compromised. AI systems should be developed using an approach based on risk prevention and so that they reliably behave as intended, while minimizing unintentional and unexpected harm and preventing unacceptable harm.
- **AI should be diverse and inclusive.** Only a handful of tech companies and elite university labs develop most of the large-scale AI systems, and developers tend to be white, affluent, technically oriented and male. Given that AI is not neutral and that technologies are a product of the context in which they are created, these systems often fail to meet the needs of different communities. AI applications must emphasize inclusion and justice and prioritize multidisciplinary and diverse teams.
- **AI should be human centred.** As AI is used to amplify human capabilities, the protection of human interests, including well-being and safety, should be the primary considerations in the design, development and deployment of AI.

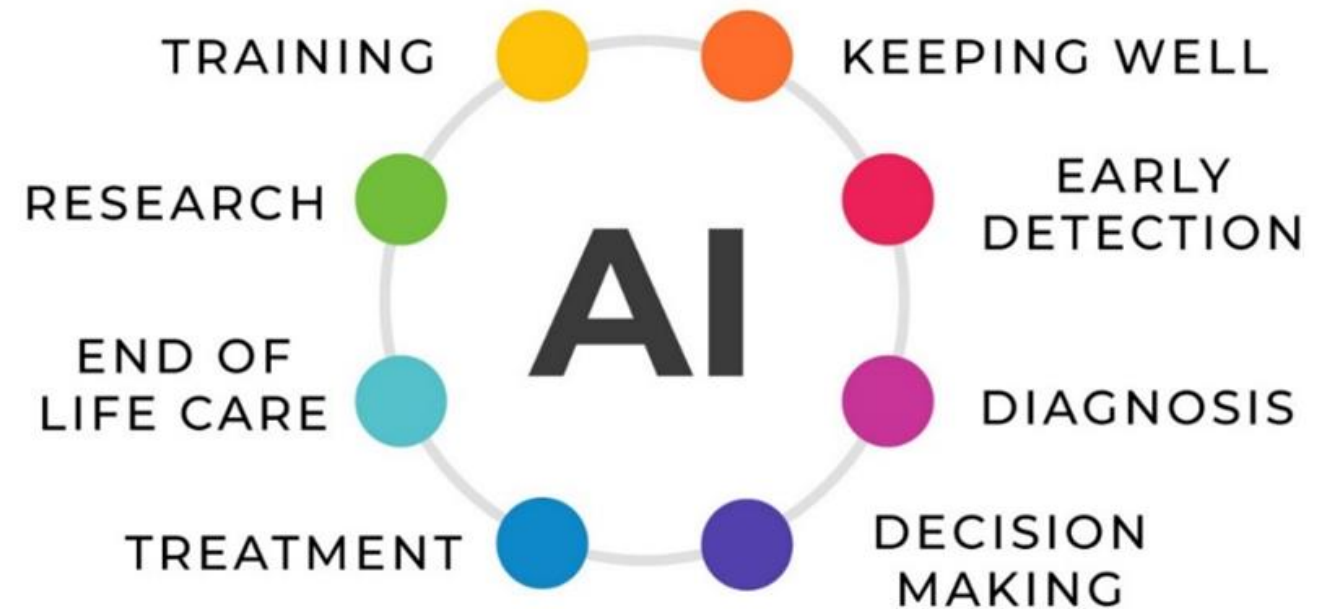


CHAPTER 2

USING AI AND BIG DATA FOR DEVELOPMENT: INSIGHTS FROM HEALTH, AGRICULTURE AND EDUCATION

II.1. BIG DATA, AI AND HEALTH

- It is estimated that 2314 exabytes of space is needed to store the total volume of global healthcare data produced by 2020. If the 2314 exabytes of data were stacked on top of each other, they would reach 82 000 miles high or circle the earth 3.2 times.
- AI and big data have the potential to improve healthcare systems worldwide by optimizing workflows in hospitals, providing more accurate diagnoses, optimizing clinical decision-making and bringing better medical treatments to patients. AI can be deployed in health training, keeping well, early disease detection, diagnosis, decision-making, treatment, end of life care and health research. For instance, AI can outperform radiologists in cancer screening, particularly in patients with lung cancer, with results suggesting that the use of AI can cut false positives by 11 %.



Use cases of AI in health care, source: Adapted from PwC,
<https://www.pwc.com/gx/en/industries/healthcare/publications/ai-robotics-new-health/ai-robotics-bubbles.png>

II.1. BIG DATA, AI AND HEALTH - EXAMPLES

- **Examples of the deployment of big data and AI in health care in developing countries abound.** In the Republic of the Gambia, a probabilistic decision-making system has been used to assist rural health workers in identifying life-threatening conditions in outpatient clinics, with medical AI performing reasonably well in detecting 88 per cent of cases. Computerized Aid To Treat (CATT) has been used in drug prescriptions in South Africa by nurses, based on a cost-and-effectiveness algorithm.
- **Kimetrica, a social enterprise, has used facial recognition AI in its machine learning tool, MERON, as a less intrusive and more reliable predictor of malnutrition in children aged under five than the traditional measurement of the circumference of the mid-upper arm.** The method used by Kimetrica is effective in low-resource environments, such as conflict zones, where it is difficult to send people with large equipment to take measurements.
- **AI had been deployed to respond to public health concerns by anticipating outbreaks of diseases such as Zika and dengue fever.** By partnering with Artificial Intelligence in Medical Epidemiology (AIME), a start-up that analyses existing local government datasets in combination with satellite-image recognition systems, the Brazilian NGO Viva Rio has been able to deliver low-cost quarterly predictions of where a greater disease incidence may occur.
- **South Africa is piloting the deployment of robotic pharmacists which dispense drugs to people living with HIV through its Right to Care project in the Helen Joseph Hospital in Johannesburg.** These robotic pharmaceutical dispensaries, which are funded by the Department of Health and the Global Fund, do not reveal the patient's identity, thus mitigating any social stigma associated with the disease. Additionally, they dispense medication to other chronically ill patients suffering from tuberculosis. The deployment of such robot pharmacists has eliminated the need for patients to wait for hours at hospitals or clinics to get their monthly dose of antiretroviral medication.

II.2. BIG DATA, AI AND AGRICULTURE

- **Today's global population of 7.6 billion is expected to rise to 9.8 billion by 2050, with half of the world's population growth concentrated by that time in just 9 countries: India, Nigeria, the Democratic Republic of the Congo, Pakistan, Ethiopia, the United Republic of Tanzania, the USA, Uganda and Indonesia.** The growing demand for food will put massive pressure on the use of water and soil. All of this will be exacerbated by climate change and global warming. Most of the world's food is harvested by smallholder farmers faced with poverty and food insecurity.
- AI, however, has risen to the occasion and is steadily emerging as part of the sector's technological revolution, including through improvement in the accuracy of cognitive computing technologies, such as image recognition, even though agriculture has traditionally relied on the eyes and hands of experienced farmers to identify the right crops to pick.
- The use of AI and related technologies has the potential to benefit productivity and efficiency at all stages of the agricultural value chain:
 - **Crop and soil-health monitoring and provision of real-time advice to farmers.** The agricultural tech start-up PEAT has developed Plantix, a deep-learning application that identifies potential defects and nutrient deficiencies in soil. Software algorithms analyze the data and correlate foliage patterns with certain soil defects, plant pests and diseases
 - **Increased efficiency and utilization of farm mechanization.** aWhere uses ML algorithms in connection with satellites to predict weather, analyse crop sustainability and assess farms for the presence of diseases and pests. FarmShots is a start-up focused on analysing agricultural data derived from satellite and drone images. Its software can inform users exactly where fertilizer is needed and reduce the amount used by nearly 40 %. The software is marketed for use across mobile devices.
 - **Augmenting farmers' capabilities with agricultural robots.** Companies develop and program autonomous robots to handle essential agricultural tasks. Abundant Robotics is a company that has developed an apple-vacuum robot that uses computer vision to detect and pick apples with the same accuracy as a human. Harvest CROO Robotics has developed a robot to help pick and pack strawberries, capable of harvesting 3.2 hectares a day, thereby addressing the issue of labor shortages in key farming regions.

II.2. BIG DATA, AI AND AGRICULTURE



II.3. BIG DATA, AI AND EDUCATION

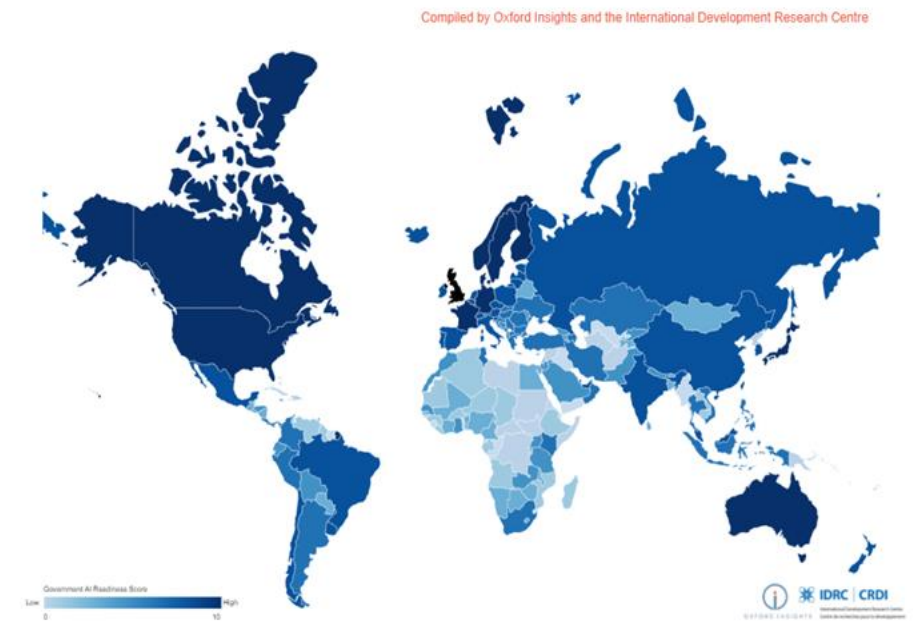
- **AI algorithms can assist teachers by collecting, analyzing and correlating every interaction that takes place in physical and virtual classrooms, and thereby personalize the learning experience. Online tutoring is another exciting development.** Brainly, a social media platform that enables millions of students to connect and do homework and assignments together, while other platforms like Freck, Carnegie Learning, and Thinkster are working on intelligent tutoring systems that are able to mimic the benefits of one-on-one tuition. zSpace has developed an augmented reality tablet that uses a stylus and glasses for interactive learning experiences.
- **There are multiple AI-powered platforms that create digital profiles of each student by collecting live information based on the user's interaction with course material.** Zoomi, for example, tracks micro-interactions such as viewing specific slides or pages in PDF documents, replaying a specific video segment or posting a question or answer on a discussion forum. Data are then used to build a model that can give real-time insights into a student's understanding of and engagement with specific topics.
- **AI technologies can ensure equitable and inclusive access to education, providing marginalized people and communities, such as persons with disabilities, refugees and those out of school or living in isolated communities, with access to appropriate learning opportunities.** For example, telepresence robots allow students with specific needs to attend schools at home or in hospital or to maintain continuity of learning during emergencies or crises. Arifu, an education technology company based in Kenya, offers an AI chatbot platform that can deliver personalized learning on mobile devices and provide access to information on topics such as farming, entrepreneurship or financial literacy to the underserved.
- **Even though AI and big data analytics can bring many positive developments to the education sector of developing countries, there are still inherent obstacles to their deployment.** The benefits of AI are mainly reaped by developed countries with abundant resources and human capital, while job displacement leaves developing countries worse off. AI can contribute to increased inequality due to the uneven global distribution of educational and computing resources. The existing biases in the data used to train AI algorithms may result in increased discrimination in developing countries and among vulnerable populations



CHAPTER 3

BIG DATA AND AI FOR DEVELOPMENT: POLICY AND REGULATION

- The 2020 Government AI Readiness Index scores the governments of 194 countries and territories according to their preparedness to use AI in the delivery of public services.
 - Developing countries around the globe, and LDCs in particular, are lagging behind their developed counterparts in terms of AI readiness.
 - For most governments, where the use of AI in public services is still in its infancy, understanding AI and big data readiness and building capacity to improve that readiness is the essential groundwork on which implementation can be achieved.
 - The index shows that the lowest-scoring regions on average are sub-Saharan Africa, Latin America and the Caribbean and South and Central Asia. Very few countries in the Global South in particular have published national AI strategies. In sub-Saharan Africa, for example, only Mauritius currently has a strategy, with Kenya in the process of developing one.
 - According to the index, many developing countries must work to expand their technology sectors, develop the business environment and a skilled AI workforce and establish appropriate regulatory and ethical frameworks



AI Government Readiness Index, Source:
<https://www.oxfordinsights.com/government-ai-readiness-index-2020>



■ Governments need to prioritize the development of sector-specific guidance and co-regulatory tools to accelerate digitalization. Regulatory areas that should be taken into account are the following:

- **Data protection laws.** Having an appropriate regulatory framework for the protection and transfer of personal and non-personal data is of the utmost importance to creating a suitable national AI and data system.
- **Sectoral regulatory frameworks.** Given the diverse and fast-changing nature of the technology, sectoral regulatory frameworks may offer extra user privacy and security protection, in addition to a dedicated central law. Japan and Germany have developed new frameworks applicable to specific AI issues, such as the regulation of next-generation robots and self-driving cars, respectively.
- **Intellectual property (IP) laws.** Having adequate IP laws encourages private-sector investment in AI and data and protects the interests of the public. Text and data mining (TDM) is a key enabling technology for AI, ML and data analytics.

- **Anti-trust/competition laws.** AI solutions have an impact on competition and openness of markets around the globe. Companies might (ab)use AI as a means of collusion with limited or no human involvement, such as on pricing via price monitoring and matching algorithms.
- **Consumer protection laws.** AI and big data are reshaping the risk associated with consumer privacy and data security through profiling and automated decisions.
- **Cyber and information security laws.** The fast-evolving cybercrime landscape is a significant challenge for law-enforcement regulators, especially for cross-border enforcement. This is further compounded by AI solutions making it much easier than ever before to conduct cyberattacks.

III.1. DATA PROTECTION, PRIVACY AND CYBERSECURITY

- **From a regulatory point of view, the crux of the matter is who has access to and control over the data.** Is it the government, the users or the service providers who store the data? From a legal perspective, there is no legal system that offers ownership of raw data. Imagine the following scenario: if a car dealer has access to personal information, what obligation do they have to store and protect it? Can personal data be shared with third parties, the so-called data brokers? Can the car dealer charge a higher price to car buyers who refuse to share their personal data?
- **Many developing economies have adopted measures that create barriers to the cross-border transfer of data, such as data localization laws, tariffs on cross-border data transfers, bans on trade in data and personal data protection laws.** Data localization laws require the storage of data, locate data centres within one jurisdiction and restrict the ability to move and process personal data across borders, for reasons of national security, personal data and privacy protection and ensuring of access to law enforcement data.

Core principles of data protection

- **Openness.** This obliges organizations to be open about practices related to the collection of personal data.
- **Collection limitation.** This requires the collection of a person's data to be limited, lawful and fair.
- **Purpose specification.** This requires personal data to be collected for specified, explicit and legitimate purposes.
- **Use limitation.** This precludes the use of data outside the scope of the previously stated specific purposes.
- **Security.** This requires that an individual's personal data must be subject to appropriate safeguards.
- **Data quality.** This requires that personal data collected must be relevant, accurate and kept up to date.
- **Access and correction.** This provides for the right of individuals to be able to access and correct their personal data.
- **Accountability.** This demands that data controllers and processors comply with all the above-mentioned data protection principles.

How anonymization does not always equate to privacy: the case of re-identification

A recent study by Nature Communications suggests that anonymization does not always equate to privacy. Researchers from Imperial College London and the University of Louvain have developed an ML model that estimates how easily individuals can be re-identified from an anonymized dataset by entering their zip code, gender and date of birth. On average, in the US, those three records can be used to correctly locate individuals in an "anonymized" database 81 per cent of the time. Using 15 demographic attributes for someone living in Kenya, there's a 99.98-per-cent chance that you could find that person in any anonymized database.

C. Jee, You're Very Easy to Track Down, Even When Your Data Has Been Anonymized, MIT Technology Review, 2019

Data philanthropy

The promise of big data for development will not be fulfilled if private corporations refuse to share data. The UN Global Pulse, for instance, has promoted the concept of "data philanthropy," under which corporations take the initiative to anonymize their datasets and provide data to social innovators to mine for insights, patterns and trends in real or near-real time.

Krikpatrick, Robert (2011) "Data Philanthropy: Public and Private Sector Data Sharing for Global Resilience." UN Global Pulse.

III.2. OPEN DATA POLICIES FOR DEVELOPMENT

Equality. Can lead to the more equitable and democratic distribution of information.

Flexibility. Easier to repurpose and combine with other pieces of information when released in an interoperable, machine-readable manner.

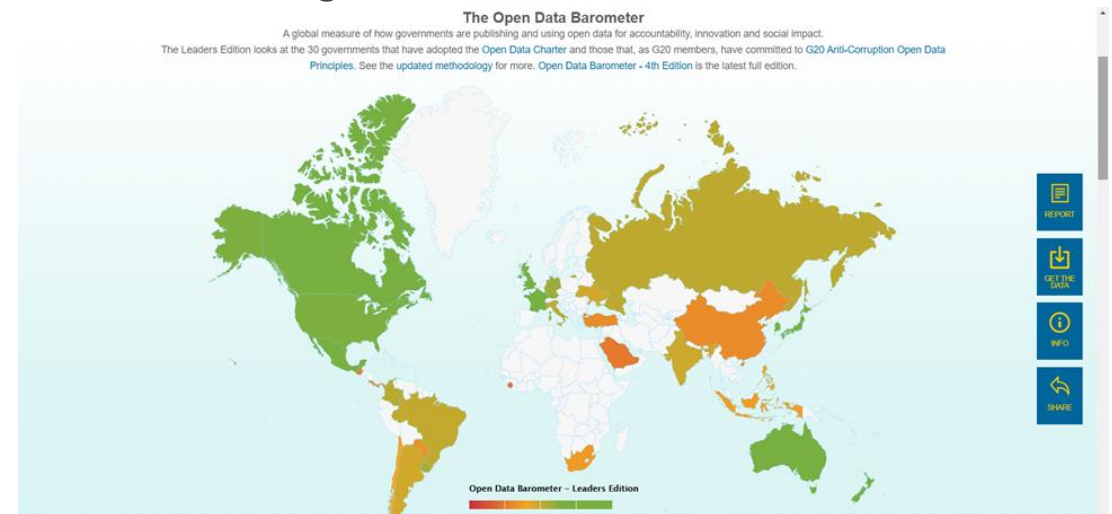
Value amplification. Provide new opportunities for governments to collaborate with citizens and evaluate public services by giving access to those services.

Scrutiny. Support the public oversight of governments and help to reduce corruption by enabling greater transparency.

Trust. The transparency of open data creates avenues for citizen oversight and higher levels of trust.

Participation. Provide individuals with the opportunity to engage with their governments and contribute to the improvement of public services by providing feedback to government ministries on service quality.

- **However, open data alone do not have an automatic impact on development.** The Open Data Barometer, a global measure of how governments around the world are publishing and using open data for accountability, innovation and social impact, recognizes that data are just one element of the equation. Other factors that complement open-data frameworks include fostering the kind of governance and economic and regulatory environments that can influence access to and sharing and use of data.



III.3. DATA SKILL POLICIES IN DEVELOPING COUNTRIES

Table 1

	Data and AI knowledge	Data and AI skills
Key elements	• Understand the theory of data analysis, statistics, AI-related mathematical concepts and computer programming. • Understand how data are generated, how to process data based on a statistical understanding and how to create and/or use AI algorithms to recognize significant patterns and improve decision-making processes. • Understand concepts across multiple disciplines and identify the benefits, limits and risks of big data and AI.	• Develop efficient and stable processes to collect, store, extract, transform, load and integrate data at various stages in the data pipeline. • Read, manage, analyse and process data from a variety of sources; and prepare data in a structure that is easily accessed and analysed according to specific requirements. • Create and build knowledge by analysing data, communicate its meaning to others with various data visualization tools; and present strategical patterns, trends, analytical insights derived from data. • Recognize data limitations by identifying when data is manipulated. • Develop, select and apply relevant algorithms and advanced computational methods to enable systems or software agents to learn, improve, adapt and produce desired outcomes or tasks. • Use AI as a tool to enhance efficiency in creative processes and develop strategies for using it to optimize performance (e.g. predictive behaviour analytics and pattern recognition). • Understand how data and AI may affect one's perception and reasoning, i.e. being able to leverage AI to augment one's own intelligence while remaining aware of how human value judgements play into data and AI applications.

■ **To take advantage of the data economy, developing countries need to equip their populations with the requisite digital skills. Educational programs that deploy rapid data and AI-skill training are in increasing demand in order to develop data skills and capabilities for the use of data tools by innovators, entrepreneurs and government agencies.** Data literacy is increasingly considered a core skill, with some research suggesting that 90 %of jobs in advanced economies already require a measure of data skills, while less than one-third of the population possesses adequate skills. Governments must work quickly to close this gap, which is even wider in developing countries. To that end, governments need to recognize that digital literacy should be complemented by foundational, language and non-cognitive skills to help graduates succeed in digital labour markets.

■ Data and AI literacy could be defined as the ability to generate, process, analyse and present meaningful information from data and develop, use and apply AI and related algorithmic tools and strategies to guide informed, optimized and contextually relevant decision-making processes. Table 1 outlines the key elements of data and AI knowledge and data and AI skills, as identified by the DQ Institute.

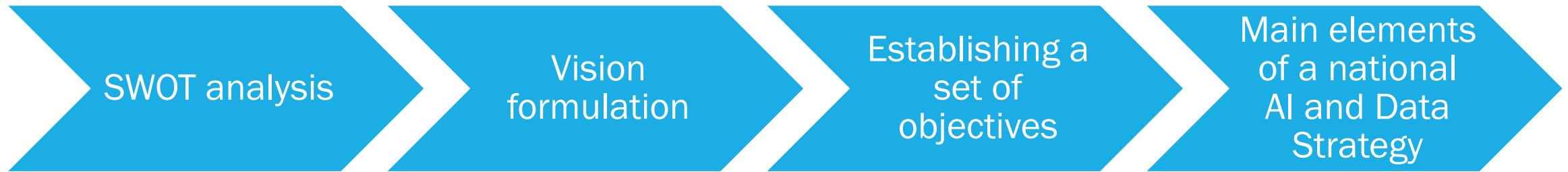
III.3. DATA SKILL POLICIES IN DEVELOPING COUNTRIES

- Inclusion of data and AI literacy in government-supported basic-skill programmes.
- Support for advanced digital skills.
- Incorporation of coding into school curricula.
- Organization of campaigns and training to develop AI and data skills in under-represented groups and adaptation of AI and big data curriculum and training methods to be more inclusive.
- Offering of free or subsidized AI and big data training.



CHAPTER 4

DATA AND AI FOR DEVELOPMENT: A GUIDE FOR NATIONAL STRATEGY



IV.2. SWOT ANALYSIS FOR NATIONAL AI AND DATA STRATEGIES

Elements	Strengths	Weaknesses	Opportunities	Threats
Governance				
Regulation				
Ethics				
Digital and data skills - AI and data human capital - Reskilling/upskilling - Employment/social security				
Digital environment and data infrastructure - Access to electricity - ICT infrastructure - Quality of data - Availability of data - Data capability				
Innovation ecosystem Research and innovation in AI and data Entrepreneurship				
AI and data priority sectors - Agriculture - Education - Health - Transport and mobility - Energy - Governance, inclusiveness - Other				
International collaboration				

IV.3. FORMULATION OF AN OVERARCHING VISION

Examples of strategic questions for the formulation of a national AI and data strategy

- How can big data and AI help to address development challenges?
- What are our key priorities in terms of development, and can big data and AI be useful tools in addressing them?
- What are our specific goals, preconditions and expectations for AI and data?
- What is the long-term motivation behind our investment in AI and data?
- Will AI have a positive impact that justifies the investment?
- What are the main challenges in AI and data investment in our country?
- How can the public and private sectors best work to ensure that companies receive adequate support for the production of AI-based innovations?
- How can data-driven businesses benefit from the secondary use of public-sector data and information resources?
- How will AI affect us as individuals and what impact will it have on the future of work, the labour market and social security? What will be its wider impact on society?
- What types of measures are required from the public sector as we move into the age of AI? What is our approach to questions of ethics, personal data protection, privacy, transparency, trust and accountability?

IV.4. ESTABLISHING A SET OF OBJECTIVES

■ **Objective 1. Create a human-centred AI and data system**

- Example: create a guideline on human-centric AI and data systems.

■ **Objective 2. Develop robust digital infrastructure**

- Example 1: Create or increase the capacity of national data centres to a capacity of X within N years.
- Example 2: Invest X per cent more in connectivity and electricity infrastructure within N years.

■ **Objective 3. Create a skilled workforce in AI and data**

- Example: Increase the workforce with appropriate digital, data and AI skills by X per cent within N years.

■ **Objective 4. Increase R&D in data, AI and priority areas**

- Example: Increase or launch research and development grants in data, AI and priority areas for a total of X million within N years.

■ **Objective 5. Improve the targeted sectors (e.g. health care, education, agriculture, trade, transport, energy, food, etc.)**

- Example: Increase investment in the targeted sectors by X per cent within N years.

■ **Objective 6. Create an enabling environment to foster the development of AI and data**

- Example: Create, adopt and enact policies and regulations that are prerequisites for AI and data development, i.e. data protection, intellectual property, anti-trust, consumer protection, etc.

■ **Objective 7. Develop innovative and agile regulation**

- Example: Create X public policy labs, regulatory sandboxes, etc. within N years.

■ **Objective 8. Unlock the value of data across the economy**

- Example: Create a data sharing framework (including interoperability) within N years.

■ **Objective 9. Digitalize public (and private) sector services and transform the government's use of data to drive efficiency and improve public services**

- Example 1: Digitalize X per cent of public (and private) sector services, including national archives, health records, etc.
- Example 2: Increase the government's use of data by X per cent to drive efficiency and improve public services.

■ **Objective 10. Ensure the security and resilience of data infrastructure**

- Example: Ensure X-per-cent security and Y-per-cent resilience of data infrastructure within N years.

■ **Objective 11. Promote the full opening of public data held by public institutions**

- Example: Make public data held by public institutions fully open and online within N years.

■ **Objective 12. Promote the international flow of data, while respecting privacy**

- Example: Create X policies and regulations to promote the international flow of data, while respecting privacy.

IV.5. BUILDING-BLOCKS OF A NATIONAL AI AND DATA STRATEGY



IV.6. DEVISING AN ACTION PLAN

Stakeholders	Milestones	Tasks	Budget allocation
Government: ministries, legislature, local authorities			
Independent organizations: standard-setting organizations, industry organizations			
Start-ups, charities and SMEs			
Technology and data-driven or data-rich companies			
Investors in technology and data companies			
Civil-society organizations focused on vulnerable people, consumer rights, digital rights, privacy and data protection, youth, etc.			
Academic, research and policy organizations			
International data standards, regulation and governance bodies			
Law firms and other professional business services			



CHAPTER 5

DIGITAL, AI AND DATA FRAMEWORK CHECKLIST

Digital, AI and Data
Framework Checklist

Online consumer
protection

Data protection, privacy
and cyber security

Innovative and agile
regulation

IP regulation

Intermediary liability
regulation

Open data policy

Anti-trust regulation