Briefing Note

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific
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Realizing Data-Driven Governance

Key Topics

- Data revolution and data justice
- Data and governance
- A world awash in data
- Data governance and data management
- Data analytics, bias and intuition
- Enabling environment for data-driven governance
- Institutionalizing Data Governance
- Heightening public access and confidence
- Gearing up for big data
- Data culture in the public sector

Using data to enhance governance and government decision-making is not a new goal. The history of statistics is closely tied with the emergence of the modernizing 19th century state. What make the present situation different is that the data revolution has made the ideal more achievable.

Data revolution and data justice

The data revolution is "an explosion in the volume of data, the speed with which data are produced, the number of producers of data, the dissemination of data, and the range of things on which there is data".[1]

Many believe that the data revolution is partly due to the widespread use of information and communication technology (ICT). Increasing computing power, faster broadband connections, inexpensive sensors, pervasive mobile phones and developments in storage (such as cloud computing) have enabled the generation, collection, storage and processing of very large amounts of data.

This ICT-enabled data revolution already had significant social consequences transforming individuals from merely being "information consumers" to become "information producers". Where we used to solely watch TV and read newspapers, we now routinely create and post videos on YouTube and share messages and updates to our friends via Facebook.

As information producers, we create *digital footprints*, which represent the sum of all data that we produce as a result of our online activities.[2] Furthermore, we also produce *data exhaust*, the byproduct of our online activities. As our digital footprints and data exhaust provide significant information about our online behaviour, they are used and processed to gain valuable insights about who we (truly) are.

Not only are we now producing an increasing number of data, but technological developments have also led to the Internet of Things (IoT), with devices connected to the Internet that create new data without human intervention.[3] It has been estimated that by 2025, the IoT will create over 2 zettabytes of data.

The development of technology also enabled the evolution from "digitization" to "digitalization" to "digital transformation" and finally to "datafication".

The first stage, **digitization**, describes the process of converting analog into digital.[4] For example, when listening to music, we have moved from vinyl records to CDs, then to MP3s and now to smart phones.

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1 United Nations Secretary General's Independent Expert Advisory Group on the Data Revolution for Sustainable Development, "A World That Counts: Mobilizing the Data Revolution for Sustainable Development", November 2014, p. 6. Available at http://www.undatarevolution.org/wp-content/uploads/2014/11/A-World-That-Counts.pdf.

2 Margaret Rouse, "Data Exhaust", *WhatIs.com*. Available at https://whatis.techtarget.com/definition/data-exhaust.

3 Steve Ranger "What is the IoT? Everything you need to know about the Internet of Things right now", *ZDNet*, 19 January 2018. Available at http://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/.

4 Margaret Rouse, "Digitization", *WhatIs.com*. Available at http://whatis.techtarget.com/definition/digitization.

Data-driven governance is "the intensive and extensive use of data in how societies define and achieve their common future". While data-driven government is "one where, for all critical decisions, actionable information is available when and where needed".

Digitalization, takes this process one step further and is "turning interactions, communications, business functions and business models into (more) digital ones".[5] In business, it refers to improving business operations using digital technologies. In general, it is the integration of digital technology into everyday life.

Digital transformation is a more comprehensive process. It is the use of ICT in all aspects of an organization to fundamentally change it.[6]

Finally, technology has enabled **datafication** whereas processes and activities that were previously invisible, can now be turned data that can be monitored, tracked, analyzed and optimized. [7] For instance, emotions used to be very difficult to quantify and analyze. Today, social media makes the datafication of emotions as easy as clicking on an icon.

The increase in data made available by the evolution from digitization to datafication and from the data revolution has also brought into fore the issue of **data justice**. This pertain to the "*fairness in the way people are made visible, represented and treated as a result of their production of digital data".*[8]

Today almost half of the worlds' population are still 'invisible' – they do not produce digital footprints because they do not have access to the Internet and other digital technologies. As they are visible only to the state as subjects or clients, they are in real danger of being left out.

To address this issue, the data justice agenda includes:

- Enhancing *visibility* of those in the margins without sacrificing privacy;
- *Engagement with technology* – which includes freedom not to use specific digital technologies, how not to become part of commercial databases as a byproduct of development interventions;
- The freedom to control the terms of one's engagement with data markets; and
- *Non-discrimination* - the power to identify and challenge bias in data use, as well as, the freedom from prejudicial treatment.[9]

Data justice is necessary for an inclusive data-driven development and governance.

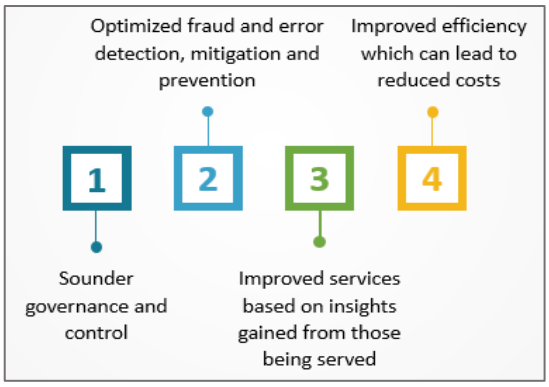
Data and governance

The data revolution, through the massive increase in quality and quantity of data, has the potential to improve governance.

The impact of data on governance can be best understood through the concept of data-driven governance and data-driven government. **Data-driven governance** is *"the intensive and extensive use of data in how societies define and achieve their common future"*.[10] While **data-driven government** is "one where, for all critical decisions, actionable information is available when and where needed".[11]

In the public sector, greater use of data can lead to: sounder governance and control; optimized fraud and error detection, mitigation and prevention; improved services based on insights gained from those being served; and improved efficiency which can lead to reduced costs.

Public Sector Benefits of a Greater Use of Data.



The explosion in data has made the use of data-driven decision-making, evidence-based policymaking and results-based management less demanding, making the access to the aforementioned benefits even

5 I-Scoop, "Digitization, digitalization and digital transformation: the differences". Available at https://www.i-scoop.eu/digitization-digitalization-digital-transformation-disruption/.

6 "What is Digital Transformation?", *Enterprise Project*. Available at https://enterprisersproject.com/what-is-digital-transformation.

7 Margarita Shilova "The Concept Of Datafication; Definition & Examples" *Technology Industry Trends*, 15 June 2017. Available at https://apiumhub.com/tech-blog-barcelona/datafication-examples/.

8 Linnet Taylor, "What is data justice? The case for connecting digital rights and freedoms globally", 16 February 2017, p. 1. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2918779.

9 Ibid p. 9.

10 B. Guy Peters and Jon Pierre *Comparative Governance: Rediscovering the Functional Dimension of Governing* (Cambridge: Cambridge University Press, 2016), p.6; and Aseem Prakash and Jeffrey Hart, "Globalization and Governance: an Introduction" in *Globalization and Governance*, Aseem Prakash and Jeffrey Hart, eds. (London and New York: Routledge, 1999).

11 Terence Lutes, "Data-driven government: Challenges and a path forward", IBM Analytics White Paper, 2015, p. 3. Available at https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=GQW03008USEN.

easier to achieve. These three processes are defined as follow:

- *Use of data-driven decision-making* – the process, which involves collecting data, extracting patterns and facts from that data, and utilizing those facts to make inferences to make decisions.
- *Evidence-based policymaking* – the use of the best available research and information on program results to guide decisions at all stages of the policy process.
- *Results-based management* – Using information and evidence on actual results to inform decision making on the design, resourcing and delivery of programs and activities as well as for accountability and reporting.

However, governments face technical and political challenges in adopting data-driven governance.

The technical issues include a lack of data standards, poor data quality, absence of interoperability framework, and poor information governance, while "Bureaucratic politics" is among the biggest political obstacle to data-driven governance and governments.

A world awash in data

Despite the current data revolution, governments in developing countries still face the challenge of lack of data. It is thus important to look both at the traditional and new data sources (such as official statistics, big data, real time data, small data and citizen-generated data) and harness them for governance.

Governments rely on **official statistics** or "numerical data-sets, produced by official governmental agencies mainly for administrative purposes". Census, survey and administrative data are staples of official statistics.

Official statistics is collected to "produce and disseminate authoritative results designed to reliably reflect economically and socially relevant phenomena of a complex and dynamic reality in a given country".[12]

Despite attempts at being comprehensive, there is a lack of official data on important concerns like gender in official statistics. *A World that Counts* notes that "Gender inequality and the undervaluing of women's activities and priorities in every sphere has been replicated in the statistical record."

A new source of data is **big data** or "datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze".[13] Some suggest that a better definition of it is "an information asset characterized by the 3Vs (volume, variety and velocity)" where "volume" refers to the amount of data, "variety" refers to the number of types of data and "velocity" refers to the speed of data processing.[14]Big data includes:

- *Exhaust data* – passively collected data from people's use of digital services such as mobile phones, financial transactions or web searches;
- *Sensing data* – actively collected data from sensors, e.g. in smart cities or from wearables and also through remote sensing and satellite images; and,
- *Digital content* – content actively produced by users of social media and in Internet-mediated transactions.[15]

The potential applications of big data in governance include:

- *Early warning:* Big data can help in detection of potential crisis through anomalies in how populations use digital devices and services;
- *Awareness*: Big data can paint a fine-grained and up-to-date picture of reality which can be used to design targeted programs and policies; and,
- *Feedback*: Big data can make it possible to understand where policies and programs are failing and make the necessary adjustments.[16]

Another source of data is **real time data**, which are delivered immediately after collection. However, in the development field, it refers to "information which is produced and made available in a relatively short and relevant period of time, and information which is made available within a timeframe that allows action to be taken in response".[17]

They include social media feeds, satellite imagery, sensor-monitored rainfall and flood levels as well as smartphone location data.

Real time data enables timely decisions and more frequent and up-to-date program and project monitoring and evaluation. It can also be used in detecting public services fraud.

12 United Nations Economic Commission for Europe, "How Should a Modern National System of Official Statistics Look?" Janaury 2008, no. 7 (p. 2?). Available at https://www.unece.org/fileadmin/DAM/stats/documents/applyprinciples.e.pdf.

13 James Manyika and others, "Big Data: The next frontier for innovation, competition, and productivity", *McKinsey Global Institute*, May 2011. Available at https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Big%20data%20The%20next%20frontier%20for%20innovation/MGI_big_data_exec_summary.ashx.

14 Margaret Rouse, "Definition: 3Vs (volume, variety and velocity)", *WhatIs.com*, February 2013. Available at http://whatis.techtarget.com/definition/3Vs.

15 Soenke Ziesche, *Innovative Big Data Approaches for Capturing and Analyzing Data to Monitor and Achieve the SDGs* (Bangkok, ESCAP, 2017), p. 18. Available at https://reliefweb.int/sites/reliefweb.int/files/resources/Innovative%20Big%20Data%20Approaches%20for%20Capturing%20and%20Analyzing%20Data%20to%20Monitor%20and%20Achieve%20the%20SDGs.pdf.

16 UN Global Pulse, "*Big Data for Development: Challenges and Opportunities*", May 2012, p. 9. Available at http://www.unglobalpulse.org/sites/default/files/BigDataforDevelopment-UNGlobalPulseMay2012.pdf.

17 Ibid.

Data governance is the "comprehensive process for controlling the integrity, use, availability, usability and security of all data owned by or controlled by an organization or enterprise".

Governments also have to look at **small data**, the human-centric alternative to big data. It is also defined as "small datasets that are capable of impacting decisions in the present". Compared to other types of data, it is accessible, informative and actionable.

John Spacey informs that it is what was previously simply known as data and the qualifier 'small' has been added "to distinguish between traditional data configurations and big data".[18]

Finally, governments can use a form of data that is becoming increasingly available, **Citizen-Generated Data (CGD)**. CGD is "data that people or their organizations produce to directly monitor, demand or drive change on issues that affect them".[19] Examples include citizen created data on air quality in Beijing, a sexual harassment map in Egypt and updated water point statuses in Tanzania.

Citizen-Generated Data can be used to verify official reports and datasets. It complements institutional data, and should not be seen as a replacement or alternative. Moreover, it is particularly useful in trying to understand communities where data is lacking like in the vulnerable and/or marginalized sectors of the population.

Data governance and data management

Data Governance and Data Management ensures that the data generated or collected are easily accessible, effortlessly shared and smoothly reusable.

Data governance is the "comprehensive process for controlling the integrity, use, availability, usability and security of all data owned by or controlled by an organization or enterprise".[20]

Data governance is implemented through a Data Governance Council (or committee) and makes the following possible:

- Better decision-making;
- Reduced operational friction;
- Protect the needs of data stakeholders;
- Train management and staff to adopt common approaches to data issues;
- Build standards and repeatable processes;
- Reduce costs and increase effectiveness through coordination of efforts; and,
- Ensures transparency of processes.[21]

On the other hand, data management is "the development and execution of processes, architectures, policies, practices and procedures in order to manage the information generated by an organization".[22] It helps ensure the availability of data when and where they are needed.

Data management is implemented "through a cohesive infrastructure of technological resources and a governing framework that define the administrative processes used throughout the life cycle of data".[23]

Data management includes developing policies, strategies, standards and programs for the following:

- Data Architecture;
- Data Modelling & Design;
- Data Storage & Operations;
- Data Security;
- Data Integration & Interoperability;
- Documents & Content;
- Reference & Master Data;
- Data Warehousing & Business Intelligence;
- Metadata; *and*
- Data Quality.[24]

Data management ensures an organization gets the most value out of its data. It is guided by data governance.

Data analytics, bias and intuition

To gain insight from data they must be analyzed. This is where data analytics come in, the "pursuit of extracting meaning from raw data using specialized computer systems... that transform, organize, and model the data to draw conclusions and identify patterns".[25]

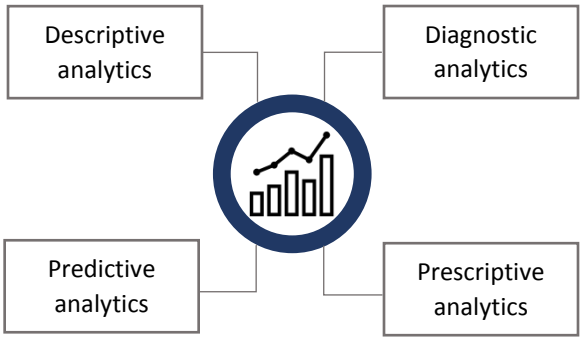
There are four types of analytics:

- Descriptive analytics provide insight to answer: *What has happened?;*

18 John Spacey, "8 Examples of Small Data", *Simplicable*, 30 January 2018. Available at https://simplicable.com/new/small-data.
19 DataShift, "What Is Citizen-Generated Data and What Is The Datashift Doing To Promote It?", n.d. Available at http://civicus.org/images/ER%20cgd_brief.pdf.
20 Nate Lord, "What is Data Governance? Data Protection 101", *Digital Guardian*, 10 September 2018. Available at https://digitalguardian.com/blog/what-data-governance-data-protection-101.
21 Data Governance Institute, "Goals and Principles for Data Governance". Available at http://www.datagovernance.com/adg_data_governance_goals/.
22 Blue-Pencil, "What is Data Management And Why it is Important", 23 November 2015. Available at http://www.blue-pencil.ca/what-is-data-management-and-why-it-is-important/.
23 Technopedia, "Data Management". Available at https://www.techopedia.com/definition/5422/data-management.
24 DAMA International, *DAMA-DMBOK: Data Management Body of Knowledge,* second edition (DAMA-DMBOK 2) (New Jersey, Technics Publications, 2017).
25 "What is Data Analytics" https://www.informatica.com/services-and-training/glossary-of-terms/data-analytics-definition.html#fbid=goi4oqkVXLo

- Diagnostic analytics measure historical data against other data to answer *why something happened;*
- Predictive analytics use statistical models and forecasts techniques to answer: *What could happen*?; and,
- Prescriptive analytics suggests *what action to take*.[26]

The 4 types of Data Analytics.



Analytics involves using an algorithm - "a set of mathematical instructions or rules that, especially given to a computer, will help to calculate an answer to a problem".[27]

Algorithms are effective and efficient tools for analysis and problem-solving. However, they are not necessarily neutral or bias-free. Algorithmic bias occurs when human prejudice and partiality are incorporated in the design.

Algorithmic bias can lead to two types of harms: *allocative harm* - when the algorithm apportions or withholds certain opportunities or resources based on prejudiced assumptions; and *representational harm* - when systems reinforce the subordination of some groups along the lines of identity.

This is why decision-makers cannot blindly trust the results of algorithms and analytics.

Another issue that arise from the use of analytics and algorithms is the role of intuition in decision-making and governance. "Data-driven" is often contrasted with the use of intuition. Is it the case that there is no role for intuition in a data-driven world?

Research has identified that intuition can be useful but only under the following conditions: *presence of expertise* - the more experience one has in the domain the better the odds of using intuition to make domain specific decisions; *nature of the problem* - intuition can be used on unstructured problems - those that lack clear decision rules or has few objective criteria with which to make the decision; and, *time available* - in situations that demand quick decision and there is little time for detailed analysis.[28]

While intuition is useful under limited conditions, it should NOT be used on situations that have clear decision rules, objective criteria and abundant data with which to perform an analysis.[29]

Andrew McAffee and Erik Brynjolfsson go further:
The evidence is overwhelming that, whenever the option is available, relying on data and algorithms alone usually lead to better decisions and forecasters than relying on the judgment of even experienced and 'expert' humans.[30]

Enabling environment for data-driven governance

Policies and programs have to be enacted/or implemented to realize data-driven governance. These include:

1. Strengthening data collection;
2. Institutionalizing data governance;
3. Heightening public access and confidence; and,
4. Gearing up for big data.

Strengthening Data Collection

There are three aspects to strengthening data collection at the national level: Improving the National Statistics System; Enhancing Gender Statistics; and, Spurring Citizen-Generated Data.

The Cape Town Global Action Plan for Sustainable Development Data is a useful guide to improving data collection and the national statistics system. It provides "the necessary actions to generate quality and timely data on a routine basis to inform sustainable development at the requested level of disaggregation and population coverage, including for the most vulnerable and hard-to-reach groups".[31]

This global plan identifies six strategic areas for action:

- Coordination and strategic leadership on data for sustainable development;
- Innovation and modernization of national statistical systems;
- Strengthening of basic statistical activities and programs, with particular focus on addressing the monitoring needs of the 2030 Agenda;
- Dissemination and use of sustainable development data;
- Multi-stakeholder partnerships for sustainable development data; and

26 Alex Bekker, "4 types of data analytics to improve decision-making", *ScienceSoft*, 11 July 2017. Available at https://www.scnsoft.com/blog/4-types-of-data-analytics.
27 Cambridge Dictionary, "Algorithm", Available at https://dictionary.cambridge.org/dictionary/english/algorithm.
28 Connson Chou Locke, "When It's Safe to Rely on Intuition (and When It's Not)", *Harvard Business Review* 30 April 2015. Available at https://hbr.org/2015/04/when-its-safe-to-rely-on-intuition-and-when-its-not
29 Ibid.
31 Andrew McAffee and Erik Brynjolfsson, *Machine Platform, Crowd: Harnessing Our Digital Future* (New York and London, W.W. Norton & Company, 2017). P. 64.
31 Ibid, p. 3

- Mobilize resources and coordinate efforts for statistical capacity building.

An important step in improving gender statistics is to refer to the UN Statistical Commission's Minimum Set of Gender Indicators. [32] This set includes 52 quantitative indicators and 11 qualitative indicators organized into five domains:

1. Economic structures and access to resources;
2. Education;
3. Health and related services;
4. Public life and decision-making; and,
5. Human rights of women and child.

It also important to refer to the 2015 UN ESCAP "core set of gender indicators for Asia and the Pacific". [33] This regional core set is composed of the following:

- Six basic domains: designed to provide information on region-wide issues on gender equality and women's empowerment;
- Five supplementary domains: these concern the issues of gender equality and women's empowerment that are considered as priorities by certain subgroups of countries in the region;
- Priority target group (rural women): these are a subset of indicators in the basic domains that reflect issues of particular concern to rural women; and,
- Qualitative indicators related to national norms: these monitor how national legislation works in ensuring gender equality through ratification of relevant international conventions and the institutionalization of specific measures and policies to eliminate discrimination against women and promote gender equality.

Governments should have an interest in spurring citizen-generated data as they not only complement official statistics but also a positive action to achieve data justice. Government actions to spur citizen-generated data include:

- Looking for ways to engage with, acknowledge and support CDG initiatives;
- Investigating funding and sustainability models for citizen-generated data and civil society data;
- Supporting consultation and participation processes to enable citizen and civil society input regarding institutional data collection, including through events, responsive communication channels and participatory design processes; and,
- Assisting research and the development of resources that can be used to make public data infrastructures more responsive to the interests and concerns of civil society.[34]

Institutionalizing Data Governance

Governments should consider developing and adopting a data governance strategy in implementing this second component of an enabling environment for data-driven governance. This strategy should include the following:

- The drivers, vision, mission and principles for data governance, including readiness assessment, internal process discovery, and current issues or success criteria;
- Structures and responsibilities for data governance activities;
- A time frame for the roll out of policies and directives, business glossary, architecture, asset valuation, standards and procedures, expected changes to business and technology processes, and deliverables to support auditing activities and regulatory compliance; and,
- A target state of sustainable data governance activities.[35]

Heightening Public Access and Confidence

The third component of an enabling environment includes two activities: Adopting an Open Data Policy and Strengthening Data Privacy.

Open Data (also Open Government Data) is data produced or commissioned by government or government controlled entities which can be freely used, reused and redistributed by anyone."[36]

The three building blocks for open data to achieve its promise of transparency, citizen empowerment and innovation are:

1. The publication of open data by governments,
2. The conversion of data to actionable information by intermediaries, and
3. The use of data by citizens, government officials and other stakeholders to achieve development outcomes.[37]

Sunlight Foundation provides a guide to developing and implementing an Open Data Policy. The guide is divided into three parts:

- What Data Should Be Public (7 recommendations)
- How To Make Data Public (16 recommendations)
- How to Implement an Open Data Policy (8 recommendations)

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32 *Minimum Set of Gender Indicators* downloaded from https://genderstats.un.org/#/home

33 ESCAP, "Core set of gender indicators for Asia and the Pacific: Note by the secretariat", Committee on Statistics, Fourth Session, 23 January 2015 (E/ESCAP/CST(4)/10). Available at http://www.asiapacificgender.org/sites/default/files/pdf/statstics_documents/Core_Set_Gender_Indicators_Asia_Pacific.pdf.

34 Jonathan Gray, Danny Lammerhirt and Liliana Bounegru, "Changing What Counts: How Can Citizen-Generated and Civil Society Data be Used as an Advocacy Tool to Change Data Collection?" *Data Shft,* March 2016. Available at http://civicus.org/thedatashift/wp-content/uploads/2016/03/changing-what-counts-2.pdf.

35 DAMA International, *DAMA-DMBOK: Data Management Body of Knowledge,* second edition, (DAMA-DMBOK 2), p. 82, (New Jersey, Technics Publications, 2017).

36 Open Knowledge Foundation, "What is Open Government Data". Available at https://opengovernmentdata.org/.

37 Andreas Pawelke and others, *Data for Development: What's Next?— Concepts, trends and recommendations for German development cooperation* (Bonn and Eschbom, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2017), p. 29. Available at http://webfoundation.org/docs/2017/12/Final_Data-for-development_Whats-next_Studie_EN-1.pdf.

Strengthening data privacy is a way to increase public confidence in data collection and use. An important way to protect privacy is to pass a national data privacy legislation that enhances the individual's control over how their personal information is collected, used, shared, and disposed. The OECD Data Protection Principles (1980) as well as the APEC Privacy Framework are useful references for those considering legislating data privacy. The EU's General Data Protection Regulation is also a touchstone document.

A recent development in this area is the use of ethics as an important complement to legal obligations to achieve privacy goals.

Many commentators share (Nobel laureate) Joseph Stiglitz' call for new regulation on what data the tech firms can store; what data they can use; whether they can merge different datasets; the purposes for which they can use that data; and what degree of transparency they must provide about what they do with the data.

Gearing up for Big Data

There are at least three issues related to promoting the use of big data in government.

The first is leadership – commitment from officials of an organization to lead at all levels and across all domains.

The second is winning and retaining public trust. This means that 1) personal data collected and held by a government agency is used appropriately and effectively, and 2) that personal data is secure, particularly when it's being shared by different agencies.

The third issue is building civil service capability in collecting, storing, analyzing, sharing and using data. This means developing a specialist data science community as well as enhancing data literacy for non-data specialists in the civil service.

Data-driven governance will not emerge spontaneously in the wake of the data revolution. Positive action, such as those described above, is needed.

Data culture in the public sector

Data culture means *using data in a pervasive way* in an organization.[38]

In the public sector, data culture means "a deep, organization-wide comfort level with using metrics to maximize social impact".[39]

The characteristics that define this culture are the following:

- *Data culture is decision culture*. The fundamental objective in collecting, analyzing and deploying data is to make better decisions.
- *Data culture and leadership*. Commitment from the highest levels must go beyond high-level pronouncements.
- *Democratization of data*. Get data in front of people by stimulating demand from the grass roots.
- *Data culture and risk*. An effective data culture puts risk at its core. Risk management should operate as a smart accelerator, by introducing analytics into key processes and interactions in a responsible manner.
- *Culture catalysts*. Someone has to lead the charge. Someone who can bridge both worlds—data science and on-the-ground operations.
- *Marrying talent and culture*. Striking the appropriate balance between injecting new employees and transforming existing ones.[40]

Building data culture would require a plan that includes: identifying internal advocates / experts; spotting key exemplars; building external relationships; leading from the top and from below; and taking small ("baby") steps.

It is important to build a data culture in the public sector as it can accelerate the adoption of data-driven governance and amplify its power.

38 Elizabeth Dunlea, " The Key to Establishing a Data-Driven Culture", *Gartner*, 30 November 2015. Available at https://www.gartner.com/smarterwithgartner/the-key-to-establishing-a-data-driven-culture/.

39 Kathleen Kelly Janus, "Creating a Data Culture", *Stanford Social Innovation Review* 2 March 2018. Available at https://ssir.org/articles/entry/creating_a_data_culture.

40 Alejandro Díaz, Kayvaun Rowshankish and Tamim Saleh, "Why data culture matters", *McKinsey Quarterly, September 2018. Available at* https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/why-data-culture-matters.

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