

TOWARDS A FRAMEWORK FOR GOVERNING DATA INNOVATION:

Fostering Trust in the Use of
Non-Traditional Data Sources
in Statistical Production

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INTRODUCTION

This report, and the research underpinning it, was commissioned by the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) in support of the United Nations Sustainable Development Solutions Network's Thematic Research Network on Data and Statistics' (SDSN TReNDS) workstream on data governance in partnership with Open Data Watch (ODW) and DataReady. The workstream has identified 'trust' as a major contributor to the use and uptake of non-traditional data sources. There are three key research questions relating to 'trust' that the workstream seeks to explore. They include:

- a. What are the factors that contribute to public trust and confidence in official statistics?
- b. Do the use of non-traditional data sources and new methods for producing official statistics affect users' confidence in them?
- c. What kinds of outreach, feedback, and data dissemination activities can help to foster trust and confidence in statistics derived from non-traditional means?

The purpose of this research paper is to help foster a better understanding of the governance factors that improve trust and confidence in statistics derived from non-traditional data sources. We interpret governance as the effective management of data in accordance with national policies and best practices. While it is beyond the scope of this paper to comprehensively answer the three research questions above, drawing on desk review analyses and evidence derived from the broad experiences of the three partners in working closely with National Statistics Offices (NSOs), it starts to explore the factors that contribute towards the engendering of trust in non-traditional sources of data. This paper is structured in two parts: Part I aims to glean insights from a series of national case studies, and Part II then aims to construct a three-part definition of trust in official statistics derived from non-traditional data sources. It proposes a draft analytical framework that links the definition to governance, with a view towards facilitating future research into the factors that either feed into or detract from trust in non-traditional data use for statistical production. The report concludes by identifying potential next steps and areas of future research.

The envisaged audiences for the insights gleaned from this research include:

- a. Staff working within NSOs.
- b. Entities operating within broader National Statistical Systems (NSSs) including data-producing departments of governmental ministries, departments and agencies (MDAs), and international development coordination partners amongst others.
- c. Members of the UN Statistical Commission (UNSC) and its various working groups, including the High-Level Group on Capacity Building and Coordination, and those relating to data stewardship and open data.
- d. Organizations and individuals that operate within the framework of the data revolution and seek to support NSS's use of non-traditional data sources to help meet and monitor the Sustainable Development Goals (SDGs), including research institutes and think-tanks like SDSN TReNDS and its members.

PART I:

THE USE OF NON-TRADITIONAL DATA SOURCES BY NSOS IN GHANA, MEXICO, AND THE UNITED KINGDOM

Overview

“New technologies are leading to an exponential increase in the volume and types of data available, creating unprecedented possibilities for informing and transforming society and protecting the environment. Governments, companies, researchers, and citizen groups are in a ferment of experimentation, innovation, and adaptation to the new world of data, a world in which data are bigger, faster, and more detailed than before. This is the data revolution.” (IAEG-DRSD 2014).

It has been over five years since *A World That Counts: Mobilising the Data Revolution for Sustainable Development* (IAEG-DRSD 2014) was first published, which set the scene for the momentous change in data production and use within the sustainable development sector that we now refer to as the ‘data revolution.’ Since its publication, there has been a flurry of activity around the world – from advanced economies to least developed states – in the application and use of non-traditional data sources to produce official statistics and other actionable insights that inform public policy and particularly support the UN’s Sustainable Development Goals (SDGs).

NON-TRADITIONAL DATA SOURCES

Often refer to disparate types of data that are derived from sources that have historically not been used to generate statistical products. Earth observation data derived from satellites and other remote sensors; administrative datasets compiled by governmental ministries, departments, and agencies (MDAs), private sector companies, and civic groups; citizen-generated data (CGD) produced through citizen science initiatives; big data and metadata sets generated and processed primarily by the private sector; and data outputs produced by automated algorithmic processing are some of the main non-traditional data sources which NSOs are experimenting with to complement more traditional survey and census-based data collection methods.

The latest iteration of TReNDS’ flagship report, *Counting on the World to Act: A Roadmap for Governments to Achieve Modern Data Systems for Sustainable Development* (TReNDS 2019a), built on many of the themes initially identified in the *A World that Counts* report, making the case for the data revolution in even starker terms, “without timely, relevant, and disaggregated data, policymakers and their development partners will be unprepared to translate their promises [the SDGs] into reality for communities worldwide.” The report identified four building blocks of innovative and inclusive national data systems:

1. Strong leadership and governance;
2. Common principles, standards, and policy frameworks;
3. An open, user-centric system; and
4. A robust funding model.

The first part of this research paper builds on the themes of these agenda-setting reports by delving deeper into the experiences of three countries that have worked to incorporate non-traditional data sources into their statistical production processes: Ghana, Mexico, and the United Kingdom (U.K.). Each case study explores examples of which non-traditional data sources are being used and how they are being deployed. Fundamentally, we are looking to understand if and how these NSOs have managed to encourage the use and uptake of non-traditional data sources by securing confidence and trust in their usage alongside official statistics. Mechanisms under consideration include legal provisions, quality assurance practices, and policy changes.

Case Study 1: Ghana

In recent years, the Ghana Statistical Service (GSS) – Ghana’s NSO – has experienced a number of developments in areas of institutional capacity building, technological advancement, innovation, and modernization in the modalities of data production. Anecdotally, many of these advancements can be attributed to the political prioritization of quality statistical production to help achieve development outcomes and the modernization of an already relatively strong institutional and legislative base, as well as the delegation of authority over statistical production to experts within the GSS, who can coordinate all statistical production across government. This case study first explores the laws and policies that underpin Ghana’s statistical system, before examining several examples of non-traditional data use in statistical production. Where possible, it highlights governance conditions that are creating an enabling environment for innovation with non-traditional data sources and encouraging its uptake.

GSS’s Legal and Policy Backbone

While Ghana has been producing statistics for public policy since the late nineteenth century, it wasn’t until 1985 that the GSS came into existence with the passage of a Statistical Service Law (GSS 2016). This codified the responsibilities of this central, executive agency, which reports directly to the President of Ghana. To further strengthen the GSS’s coordination role, in 2019, Ghana updated its statistics law, the Statistical Service Act 2019 (Republic of Ghana (RoG) 2019). Among other functions, the new Act mandates the GSS to coordinate statistical information across the whole government system, develop and raise awareness of codes of ethics and practices for the production of data, report regularly on the state of official statistics to the Government and the people, and encourage scientific independence and impartiality in the production of statistics (GSS 2020a).

Supporting the Statistical Service Act of 2019 are a constellation of provisions from the Ghanaian Constitution (1996), the Data Protection Act (2012), and the Right to Information Act (2019), among others. Read together, the Ghanaian Constitution and Data Protection Act, in particular, reinforce the Statistical Service Act by providing strong protections around the right to individual privacy in a way that distinguishes the right from the public interest inherent in the production of official statistics. For instance, Article 18(2) of the Constitution reads:

“ARTICLE 18(2)

No person shall be subjected to interference with the privacy of his home, property, correspondence, or communication except in accordance with law as may be necessary in a free and democratic society for public safety or the economic well-being of the country, for the protection of health or morals, for the prevention of disorder or crime, or for the protection of the rights and freedoms of others.” (RoG 1996)

Section 60 of the Data Protection Act (2012) provides an exemption to this constitutional right where personal data are being processed in the public interest (s. 60(1)(e)). It is worth noting that Section 65 of the Act goes on to provide a relatively generous exemption explicitly to accommodate the production of official statistics in the public interest; so long as the data are processed in accordance with a number of relevant conditions.

Turning to access to information, Ghana’s recently enacted Right to Information Act (2019) is meant to put in effect, Article 21 (1) (f) of the 1992 constitution of the Republic of Ghana which states that “all persons shall have the right to information subject to such qualifications and laws as are necessary in a democratic society” (Daily Graphic, July 21, 2017). However, since its initial drafting in 1999, it has faced a long and rocky road of controversy and debate but was granted in November 2019 with a long list of exemptions, including information produced by many government departments (MFWA 2019). Despite these limitations, it does not appear to limit requests relating to statistical data generated by the GSS.

In addition to these legislative provisions, there are a number of policy documents that provide the overarching strategic and operational architecture for the GSS's activities. At a global level, like all NSOs, the GSS is conventionally bound by the Fundamental Principles of Official Statistics (FPOS) (UN 2014), which includes provisions on NSO independence, trust-building in official statistics through the use of standards and professional ethics, and a duty to preserve data confidentiality. At a regional level, Ghana subscribes to the African Charter on Statistics, which, among other things, promotes the forging of intra-continental and multi-stakeholder partnerships within National Statistical Systems (NSS) and broader data ecosystems (AU 2009). Of particular relevance to this research paper, Article 9(1)-(2) of the Charter specifies that third-party collaborations are welcome:

"ARTICLE 9(1)

The African Statistical System may conclude cooperation agreements with third-parties.

ARTICLE 9(2)

In the implementation of this Charter, the African Statistical System shall enter into cooperative relations with the global statistics system, particularly the Specialized Institutions of the United Nations and any other international organizations." (AU 2009)

Regarding national policy documents, the National Strategy for the Development of Statistics (NSDS) 2018-2022 (GSS 2018) and the GSS Corporate Plan 2020 – 2024 (GSS 2020b) form the backbone of the GSS's strategic and operational policies. An interesting feature of the NSDS is the emphasis it places on engaging with the public, as the ultimate consumers of statistics, noting the beneficial effect this is likely to have on public use and confidence in the NSS produced or curated data:

"The GSS, through the NSDS I, has provided a stronger identity and greater visibility for the NSS and created awareness of the importance of statistics. The GSS continues to use the celebration of the annual African Statistics Day as a major springboard to raise awareness among the public about the important role played by statistics in all aspects of social and economic development. The major players in the NSS also take advantage of the Day and other statistical literacy programs to advocate for systematic and increased use of statistics for evidence based decision-making, as well as provide opportunities to increase the scope and relevance of statistics. These activities have helped to sensitize the public on the role and importance of the NSS." (GSS 2018)

All of these legal provisions and policy documents provide a helpful context for understanding the privilege placed on national statistics in Ghana, the ability of the NSO to work with third-parties and use alternative sources of data, and the emphasis placed on engaging with citizens and ensuring the uptake of national statistics.

Examples of the GSS's Use of Non-traditional Data for Statistical Production

In recent years, the GSS has demonstrated innovation in the use of three non-traditional data sources, in particular: earth observation data, mobile data, and administrative data. All three examples have been well-documented by organizations, including TReNDS and the Global Partnership for Sustainable Development Data (GPSDD). Relevant case studies include the following:

- 1. Using Earth Observation Data for Statistical Production:** In 2017, the GSS joined the Africa Regional Data Cube (ARDC) initiative; a partnership between NASA, the Group on Earth Observations (GEO), and others brokered by the Committee on Earth Observation Satellites (CEOS) and GPSDD. The aim of the ARDC collaboration for Ghana was to:

"Provide capacity for Ghana to apply Earth observation data to address local and national needs, such as measuring water extent and quality, deforestation, land change, among others. It will also allow access to and use of diverse data sets via interoperable methods and support connections to common GIS tools." (GPSDD 2017)

Four years later, data outputs from the ARDC project in Ghana are being used to identify and shut down illegal gold mines. The data collected through the project are also helping to “complement traditional data collection methods, including the national census,” and the GSS anticipates there to be a significant impact on decision-making across a number of policy sectors over time (SciDev 2019). Engagement with the ARDC has also enabled the GSS to connect with new stakeholders that require this type of data. For example, a technical team, coordinated by GSS, has been established across MDAs to define a national strategy for the use of ARDC geospatial data and national capacity development (GPSDD 2017), demonstrating the government’s eagerness to engage with new datasets and build data skills across different departments.

2. **Innovating with Administrative Data:** Section 15(2) of Ghana’s Statistical Service Act 2019 requires any person in possession of data required by the GSS to produce official statistics to grant access to it. This clause is especially useful in helping the GSS access the administrative data records held by entities across the Ghanaian government at the national and sub-national levels. As a result, the GSS has been able to innovatively use administrative data, which are being put into action to improve access to public services across the country. For instance, administrative datasets are being used in the roll-out of the national ID program, aiding in the development and future capture of data needed to derive high-quality civil registration and vital statistics (CRVS) (GPSDD 2020). The GSS has also recently partnered with Statistics Denmark to help develop and improve its capacity to produce statistics needed for SDG monitoring from administrative data sources, such as strengthening their population data registries (GPSDD 2017).
3. **Using Telco Data to Improve Health Monitoring:** In 2020, TReNDS documented an example of how the GSS is using data derived from Vodafone, a telecommunications company, to monitor health outcomes in a case study entitled, *Using Mobile Data for Health Monitoring: A Case Study of Data Sharing Between Ghana Statistical Services, Vodafone Ghana, and Flowminder Foundation* (TReNDS 2020). The study was published as part of the Contracts for Data Collaboration (C4DC) project, which aimed to identify successful legal partnership agreements between governments and third-parties. It reveals valuable insights into the GSS’s use of telco data and the processes needed to support such collaborations:

“As part of the collaboration, Vodafone Ghana provided access to pseudonymized telecommunications data free of charge, and Flowminder aggregated and analyzed the data on behalf of the GSS. Initially, the parties had planned to form a non-binding agreement, but national regulators requested a formal agreement that addressed various data concerns. From the initial draft of the agreement provided by Vodafone Ghana to the final approval, negotiations took some 13 months. The negotiations were made especially challenging because the GSS did not have its own legal counsel, and the process overlapped with the introduction of the General Data Protection Regulation (GDPR). Among other issues, the agreement addresses how the data will be aggregated, the parameters for the exchange of the data between the parties, data use limitations, data deletion, and the publication of analysis results. After signing the agreement in December 2018, the parties have since enjoyed a successful collaboration, and the mobile data being used by the GSS has proven especially valuable during the current Covid-19 pandemic to document the impact of restriction measures in Ghana.” (C4DC 2020)

Each of these examples serves to demonstrate the importance of a supportive national data policy, which empowers the NSO and broader statistical system to work with third-party actors, to enter into legal agreements with them, as well as to coordinate data collection across government. They also stress the importance of capacity development and bringing in external advisers where necessary to support this process, as demonstrated by the involvement of Flowminder in the telecommunications partnership for health monitoring.

Case Study 2: Mexico

Mexico's NSO, the National Institute of Statistics and Geography (INEGI), provides an excellent example of how new technology-enabled data processing techniques and user-accessible data publication can be deployed to complement traditional statistical methods. INEGI also benefits from having a very robust legal architecture that supports its work and a powerful mandate for its operations that stems directly from the Mexican Constitution. Moreover, INEGI sits at the heart of the Mexican NSS and is empowered by law to coordinate and lead other data-producing entities in the country. These factors have been crucial in building confidence and trust in INEGI's ability to manage new data partnerships and sources.

This case study seeks to draw out some of the legal and policy provisions that provide INEGI with the framework that it needs to be able to innovate with the use of non-traditional data sources, and it explores how it is innovating with non-traditional data sources in two ways. Firstly, through the use of Earth observation data, and secondly through the application of automated algorithmic processing and big data analytics techniques. It also highlights how Mexico's robust legal frameworks support the functionality of the NSS, with INEGI at its center, and examines the dimensions that have contributed to the strengthening of trust in the use of non-traditional data sources.

INEGI's Unique Legal Positioning

INEGI is mandated by a unique combination of laws. And INEGI's innovative use of non-traditional data sources – Earth observation data, in particular – is enabled by its robust statistical legal framework, which starts at the Constitutional level. Mexico's legal framework incorporates both statistical and geographic information into a single national geographic and information system. This framework is defined within the Constitution of Mexico in Article 26 (Government of Mexico (GoM) 1917). Article 26(B) serves as grounds for innovation in the area of Earth observation data and mandates that the system, “provide timely, accurate, reliable, and relevant statistical and geographical information of national interest for policy design, analysis, evaluation, or international reports”(GoM 1917).

These Constitutional obligations are reinforced and further detailed within national legislation. Article 36 of the Law of the National System of Statistics and Geography (LSNIEG) 2008 provides for a “permanent programme of research in subjects related to the production and analysis of information, as well as innovative methodologies for the production and dissemination of information” (GoM 2006). This provision aligns with the Global Statistical Geospatial Framework (UN 2018a) produced by the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) (UN 2020) as well as with Articles 30 and 31 of Mexico's General Law of Transparency and Access to Public Information (GoM 2020a). This designates INEGI as the national institution responsible for promoting transparency and the right to information. In line with these obligations, INEGI operates a robust system for the dissemination of geospatially enabled statistics through the national open data portal (GoM 2020b) and digital map of Mexico (GoM 2020c).

In regards to the operational mechanics of this system, Mexico has been lauded by the Organization for Economic Co-operation and Development (OECD) for its procedural checks, quality assurance frameworks, and user feedback opportunities:

“Mexico has a highly developed legal and institutional framework for statistics, with significant checks and balances to ensure the professional independence of its Governing Board and staff, and the integrity of its statistical output. The framework has proven effective in avoiding political interference with Mexico's statistics, and in facilitating a steady increase in the volume and standard of its statistical output.” (OECD 2018)

LSNIEG also creates a strong framework for the operation of the whole NSS and facilitates the pooling and use of administrative data for statistical production purposes, while preserving confidentiality. Section 2 (XV) of the law stipulates that the following state entities that create administrative registries under the law are considered part of the NSS: (a) Federal Public Administration entities, including the Presidency of the Republic and Attorney General of the Republic; (b) Legislative and Judicial powers of the Federation; (c) States and Municipalities; (d) Autonomous Constitutional Organisms; and (e) Federal Administrative Tribunals. This gives INEGI considerable authority to coordinate and manage cross-governmental data.

Section 38 of the law goes on to stipulate that information provided by respondents for statistical purposes and administrative registries must be handled in accordance with the principles of confidentiality and cannot be divulged in any nominal or individualized way; nor can they be used/provided as evidence to a judicial or administrative authority. Finally, Section 62 of the law mandates that INEGI should promote the adoption of methods and technical standards in the collection of registry data, in coordination with the competent authorities who administer public directories and public registries of businesses, inventories, and other administrative registries. Taken together, these provisions work to balance the need for data confidentiality in line with normative standards, like the FPOS (UN 2014), with the need to leverage the potential of administrative and big data.

INEGI's Use of Earth Observation Data and Advanced Analytics

Earth observation data are an important new source of non-traditional data for statistical production in Mexico. Advancements in technology have enhanced the quality of digital aerial photographs, imagery from satellites, and digitally produced maps, rendering them of high enough quality to be used for the production of official statistics. INEGI synthesizes statistics and geography into a Geostatistical Framework that links geographical data groups and environmental indices, economic data, and demographic and social data, including health and census data (UNSTATS unknown).

INEGI has also demonstrated innovation in the use of a Geospatial Data Cube (UN 2018b) to acquire and index large volumes of satellite data, including raster data and geo-median images, in preparation for processing and analysis. To unlock new processing capabilities, the data cube orders images across time and enables time series analysis and change detection. INEGI has applied these innovations in geospatial data collection and processing to monitor changes in vegetation and coastal erosion and has also applied machine learning techniques to classify and analyze forest geo-median images to conduct crop identification (Merodio 2018).

Additionally, the State of Jalisco has produced a sub-national statistical system that organizes independent statistics and geospatial information online and also geo-references data to link socio-economic, environmental, and policy issues within the state (GoM 2020d). The web platform currently provides information about public and private investments, with 90 layers of geospatial information, thus facilitating decision-making and contributing to government transparency. It can also generate automated reports by municipality or region, integrating socio-demographic data with environmental and administrative variables. The platform is a joint product between INEGI and the Planning and Evaluation Sub-secretary of Jalisco State (INEGI 2017) and is enabled by the legal framework governing INEGI's actions as set out by Article 26(B) of the Constitution of Mexico and LSNIEG 2008, both referenced above. This kind of sub-national data experimentation is made possible by the strong data policy and legal frameworks within Mexico, which ensure quality assurance and confidentiality.

Case Study 3: United Kingdom

The U.K.'s NSS (led by the Office for National Statistics (ONS), the U.K.'s NSO) is also underpinned by a robust legal framework that enables and promotes cooperation and collaboration within the NSS, largely independent from political interference. The functions of the ONS are managed by the Statistics Board, which upon commencement of the Statistics and Registration Service Act of 2007, became the independent authority overseeing the production of official statistics in the U.K.

In recent years, the Digital Economy Act 2017 (U.K. Government 2017) has had a major effect on the broadening of the ONS's access to administrative data. The Act increased access to new data sources, enabling the ONS to more easily link to datasets in a way that fosters innovation. Moreover, since the ONS was granted independence from the Executive Branch of government through the Statistics and Registration Service Act 2007 (UKG 2007), it has recorded very high levels of public trust in its statistics, currently at around 85% (UKSA 2020), underscoring the importance of institutional independence and associated public awareness.

The ONS stands out as an innovator in the use of non-traditional data sources in the production of official statistics. For instance, its Data Science Campus (ONS 2020a) brings together diverse actors and disciplines to encourage innovation in the use of data science methods to enhance traditional statistical production. The ONS is also a leader in the use of big data analytics and pioneers the use of synthetic data and machine learning methods to generate and build model datasets that can be shared without compromising data confidentiality or individual privacy (ONS 2018b). This is in a large part due to the strong emphasis of data protection in U.K. and European Union (EU) law, and because data protection and individual privacy risk assessments are incorporated into all innovation-based proposals, contributing to high-integrity and trustworthy statistics.

This case study first highlights some key components of the U.K.'s statistics law and policy architecture, before delving into how non-traditional data sources are being used by the ONS and other entities in the U.K.'s NSS. It highlights three factors that contribute to the ONS's use of non-traditional data sources and that feed into the strengthening of trust in statistics: a supportive legislative framework, the use of innovative data privacy techniques, and a strong open data policy.

The U.K.'s Balance of Innovation and Rights

As the U.K. lacks a codified Constitution, the framework of laws that regulate the production and use of statistics is diverse and spread out over a number of statutes. Concerning the production of official statistics, the two main pieces of legislation are the Statistics and Registration Service Act 2007 and the Digital Economy Act 2017. The Digital Economy Act 2017 was enacted on April 1, 2018, and covers a wide range of issues that relate to access to digital services (especially broadband internet), digital infrastructure, licensing, sharing, and regulation of certain types of content online. In addition, the U.K. has a number of additional laws that mandate the ONS to obtain and use data from different bodies for specified purposes, giving it considerable liberty to identify and use data from non-governmental and cross-governmental sources (see Figure 1 below).

A SELECTION OF U.K. STATUTES RELATING TO STATISTICAL PRODUCTION

- **Digital Economy Act 2017:** Allows the ONS to gain access to data from other MDAs, as well as commercial data for the purposes of producing official statistics.
- **Statistics and Registration Service Act 2007:** Allows the ONS to obtain information relating to births and deaths, National Health Service (NHS) registration, and some Her Majesty's Revenue and Customs (HMRC) information.
- **Value Added Tax Act 1994:** Enables the ONS to obtain VAT data from HMRC, and in limited circumstances, to disclose that data to other government departments.
- **Social Security Information Act 1992:** Allows the ONS to receive information relating to pay contributions held by HMRC.
- **Agricultural Statistics Act 1979:** Permits the ONS to obtain information on agricultural matters.
- **Employment and Training Act 1973:** Authorizes the disclosure of business data in limited circumstances, for example, to local authorities for planning purposes.
- **Finance Act 1969:** Allows the ONS to receive employer information from HMRC, and in limited circumstances, to disclose that information to other government departments.
- **Statistics of Trade Act 1947:** Allows the ONS to run mandatory surveys of businesses, and in limited circumstances, to share the data received with other government departments.
- **Census Act 1920:** Allows for conducting a census and obtaining statistical information in relation to the population of Great Britain.

Figure 1: Selection of U.K. statutes relating to statistical production.

Several other statutes act as a check and balance on the ONS's ability to use data obtained from a variety of sources for statistical production. For example, The Freedom of Information Act 2000 allows individuals to request information about how the ONS is using data. And the Human Rights Act 1998 requires that the ONS abide by fundamental human rights principles, including the right to privacy, in all its operations. Additionally, the Data Protection Act 2018 requires the ONS to abide by the provisions of the EU's General Data Protection Regulation (GDPR). Taken together, these diverse pieces of legislation provide a well-balanced enabling environment for innovation, while protecting individuals' right to privacy, access to public information, and confidentiality over their data.

In February 2018, the ONS published the 2nd Edition of its *Code of Practice for Statistics: Ensuring Official Statistics Serve the Public* (ONS 2018a). The Code of Practice, while not strictly a 'law', is nevertheless binding guidance that the ONS and other entities in the NSS must abide by. The Code has been lauded for its accessibility and use of non-technical language, and it focuses on three interconnected pillars: trustworthiness, quality, and value. It "aims to provide the framework to ensure that statistics are trustworthy, good quality, and are valuable – that they measure the things that most need to be measured" (ONS 2018a). The Code is based on several key principles including:

- Those producing statistics must demonstrate their integrity and professionalism, reflecting the public interest and protecting confidentiality above all;
- That statistics be based on the right data sources, with transparent judgments about definitions and methods, and judgments about the strengths and limitations of statistics;
- That statistics must be "equally available to all, and not be released partially or to select audiences. They should be aimed at society's important questions and be produced efficiently" (ONS 2018a).

Interestingly, the Foreword explicitly states that the Code is not only concerned with official statistics, but also with a wider range of data "that has not traditionally been described as official statistics," including administrative registries and third-party data being used to glean key policy insights (ONS 2018).

The U.K. is also a good example of a country that adopts an ‘open by default’ (Open Data Charter 2015) approach to public information disclosure. The principle has informed the development of the UK’s Open Government License (OGL) (UKG 2020), which is used by all government departments and covers all “works made by officers or servants of the Crown [government] in the course of their duties,” as set out under section 163 of the Copyright, Designs and Patents Act 1988. The OGL abides by the Open Definition (Open Knowledge 2020) and authorizes the free copying, publication, and transmission of all information published under the license; its adaptation; and use of the information, including for commercial gain. The license does require that the source be attributed, and, where possible, that a link to the license be provided with any data that are re-used. Importantly, the license provides an example of legal interoperability across jurisdictions, and it explicitly states that:

“These terms [of the license] are compatible with the Creative Commons Attribution License 4.0 and the Open Data Commons Attribution License, both of which license copyright and database rights. This means that when the information is adapted and licensed under either of those licenses, you automatically satisfy the conditions of the OGL when you comply with the other licenses. The OGL v.3.0 is Open Definition [Open Knowledge International] compliant.” (UKG 2020).

The effect of the OGL is that the ONS, for example, is legally enabled to produce an SDG reporting platform using open-source software and publish it on GitHub (GitHub 2020). This allows any user to replicate the platform or embed it on their own website, access its data, and adapt and reuse the data published through the platform for free, subject only to the minimal provisions of the Open Government License.

Pioneering the Use of Non-Traditional Data Production and Analytics Methods

There are numerous examples of the U.K. using non-traditional data. Three particularly pertinent ones that highlight the U.K.’s efforts to assure quality and confidentiality, thereby promoting confidence in new data sources, include the following:

- 1. Using Synthetic Data to Preserve Confidentiality and Protect Privacy:** Synthetic datasets are artificially created datasets that replicate key attributes contained in real micro/administrative datasets across artificial individual cases. In this way, they provide an enhanced layer of confidentiality and help to protect individuals’ privacy without compromising data quality or granularity, which is vital to disaggregation. Within the U.K., the ONS has been experimenting with synthetic datasets as a method of statistical disclosure control. In other words, a way of providing access to highly granular data to non-statistical users (other MDAs, researchers, etc.) which would otherwise be off-limits to preserve confidentiality (ONS 2018b). The approach is gaining traction across data policy circles in the U.K., and in 2018, a think-tank named Reform recommended that “public-sector organizations should offer synthetic datasets, which they can share with others so that requests for data adhere to the right data standards in each organization.” (Reform 2018)
- 2. Applying Quality Assurance Techniques to Administrative Datasets:** To ensure that the quality of statistics derived from administrative sources remains high, the ONS utilizes an Administrative Data Quality Assurance Toolkit (last updated in 2019) (ONS 2019a). The ONS occasionally publishes case studies of how the framework has been applied to specific datasets, thus also reinforcing public trust in the use of administrative data. Two examples include the application of the quality assurance toolkit to the Department for Communities and Local Government’s Indices of Deprivation (ONS 2015) and the Department for Education’s school-level examination results statistics (ONS 2020b).
- 3. Experimenting With Telecommunications Data to Monitor Urban Traffic Flows:** Telecommunications data, or ‘mobile data,’ are data derived from telecommunications firms’ private administrative datasets. When anonymized and de-identified, these datasets can be of substantial benefit to statistical production, and a number of NSOs around the world are using them for that purpose. In the U.K., the Data Science Campus, based within the ONS, is collaborating with the data analytics company, CitiLogik, to research the potential use of anonymized mobile data compiled by Vodafone UK to estimate commuter traffic in metropolitan areas. While these research data outputs are not official statistics, they are of interest to the ONS as a potential future administrative dataset that could either complement or even replace parts of the national census (ONS 2019b).

PART II:

A FRAMEWORK FOR MAPPING NSO GOVERNANCE PRACTICES THAT FOSTER TRUST IN THE USE OF NON-TRADITIONAL DATA SOURCES

“Bearing in mind that the essential trust of the public in the integrity of official statistical systems and confidence in statistics depend to a large extent on respect for the fundamental values and principles that are the basis of any society seeking to understand itself and respect the rights of its members, and in this context that professional independence and accountability of statistical agencies are crucial.” (UN 2014)

‘Trust’ in official statistics is a theme that permeates many, if not all, statistical laws and policies to a greater or a lesser degree – from national to international levels. The excerpt above, for instance, comes from the Fundamental Principles of Official Statistics (FPOS), the overarching international normative framework that guides the actions of NSOs around the world. However, ‘trust’ in official statistics can be interpreted in many ways. Drawing on insights gleaned in Part I of this paper, this section first offers a three-part definition of trust in official statistics derived from non-traditional data sources and then proposes an analytical framework that links the definition to governance, with a view towards facilitating future research into the factors that either feed into or detract from trust in non-traditional data use for statistical production.

Defining Dimensions of ‘Trust’ in Official Statistics

There are two ways to approach the notion of trust in official statistics. Firstly, it can be approached from the viewpoint of statisticians themselves who must have trust in the quality and integrity of a non-traditional data source before they can derive official statistics from it. Secondly, it can be approached from the viewpoint of society at large, who must have trust in the usability and interpretation of the statistics once they have been released. These views are mutually reinforcing – you cannot have trust in the usability of statistics if the data that underpin them are of poor quality and those producing them lack integrity.

When the excerpt from the FPOS above is examined through an analytical lens focusing on the notion of trust, it is possible to extract three distinct dimensions that together form the basis of a definition for the concept of ‘trust’ in official statistics.

The first dimension is **trust in the quality of data that underpins statistical production**. Data quality is a broad area, but generally speaking, it refers to the overall utility of a dataset based on its provenance, the data collection method used, and how it has been processed. The second dimension is **trust in the integrity of the statistics**. Integrity is a tricky notion to pin down, but, as referenced in the FPOS excerpt above, it depends on the “respect for fundamental values and principles that are the basis of any society seeking to understand itself and respect the rights of its members” (UN 2014). This is often made most visible through transparent and accountable governance structures overseeing the production of statistics, as noted by many of the NSO practices cited in Part I. Finally, the third dimension is **public trust in the presentation and interpretation of statistics**. In other words, trust in how statistics are being presented to the general public. This is often the most common interpretation of ‘trust’ in statistics and is often referred to as ‘public trust’ in statistical laws and related legislation. For instance, almost all references to ‘trust’ found in the UN Economic Commission for Europe’s (UNECE) Generic Law on Official Statistics (GLOS) (UNECE 2016) and its accompanying Guidance on Modernizing Statistical Legislation (UNECE 2018) frame it in these terms.

Two cross-cutting themes that are important to fostering trust, but are not necessarily integral to its definition, are the notions of NSO ‘independence’ and ‘accountability.’ These conditions are fundamental to ensuring trust in the integrity of statistical processes and outputs. The value of NSO independence especially is already recognized as being as a cornerstone principle, as reflected in the FPOS, and elaborated on in the Explanatory Notes to the Generic Law on Official Statistics (ECOSOC 2016) approved by the UN’s Economic and Social Council (ECOSOC):

“Professional independence [of NSOs] from policy, regulatory, or administrative authorities, as well as from private interests, is the **prerequisite for producing high-quality statistics and securing trust of users** and respondents. The credibility of the National Statistical System builds on users’ trust in official statistics as an objective source of information that does not serve any interests. [...] **Professional independence is a cornerstone principle** [emphasis added] [...]” (ECOSOC 2016)

Indeed, if we recall the examples in Part I of this paper, one of the attributes that NSOs in Ghana, Mexico, and the U.K. shared was their independence from other branches of government. And in the U.K., surveys have revealed that trust in the ONS’s statistics have improved since it gained independence from the Executive Branch in 2008 (UKSA 2020).

By distilling the above definition, themes, and replicable lessons from each of the case studies, it is possible to identify two pre-requisites and three dimensions of trust in official statistics, which taken together provide us with the basis for an analytical framework for future research (see Table 1 elaborated on in the next section).

PRE-REQUISITES AND DIMENSIONS OF TRUST IN OFFICIAL STATISTICS DERIVED FROM NON-TRADITIONAL DATA SOURCES

Pre-requisites:

1. NSO independence
2. NSO accountability

Dimensions of trust:

1. Trust in the quality of data that underpins the statistics
2. Trust in the integrity of the statistics
3. Public trust in the use and interpretation of the statistics

Figure 2: Pre-requisites and dimensions of trust in official statistics derived from non-traditional data sources.

A Proposed Framework for the Analysis of ‘Trust’ in Non-traditional Data Sources

So far, Part II has focused on defining the pre-requisites and factors that feed into trust of non-traditional data sources for use in official statistics, by both statisticians and the general public. To build this into an analytical framework that links the dimensions of trust to data governance, it requires a consideration of the data processing dimensions and the stages involved in statistical production. To this end, the Data Value Chain (Open Data Watch 2019), developed by Open Data Watch and Data2X, provides a useful reference point (see Figure 3) that establishes four concrete stages of value across data production and use: data collection, data publication, data uptake, and data impact.

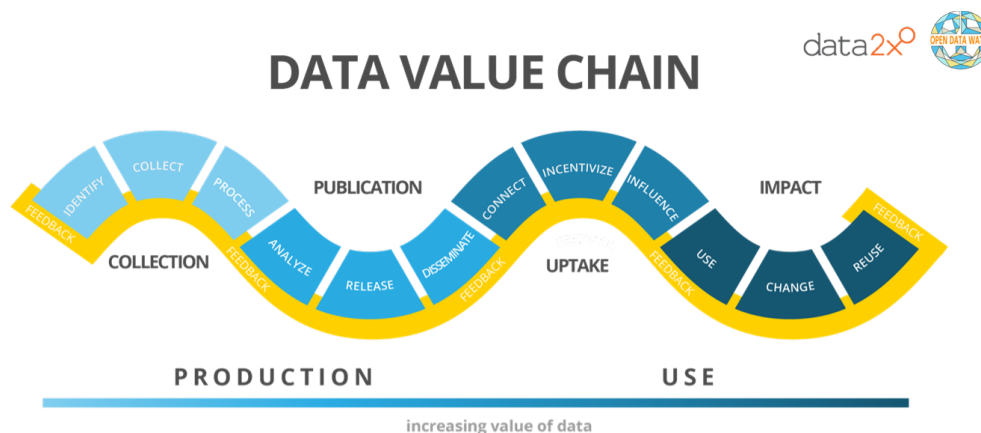


Figure 3: Data Value Chain (Open Data Watch 2019).

By combining the elements of our definition of trust with the data value chain model, it becomes possible to develop a matrix that can be used to assess and potentially measure the extent to which governance frameworks and practices of NSOs around the world are built in ways that support the fostering of trust in non-traditional data sources for official statistics (see Table 1 below). Many, but not all, of these considerations have been identified through observation of the practices undertaken in the three case study countries.

Proposed Framework for the Analysis of Trust in the Use of Non-Traditional Data Sources for Statistical Production			
Pre-requisite Requirements for Trust in Statistics (Regardless of Data Source)			
Is the NSO independent of other branches of government? (e.g., Does the Chief Statistician and NSO have sufficient power delegated to them to operate independently of external pressures?)		Y/N/Other Elaboration:	
Is the NSO accountable to elected officials? (e.g., Is annual reporting on activities to an elected body – legislature, select committee, etc. – required?)		Y/N/Other Elaboration:	
Assessing Trust in Non-traditional Data Sources Across the Data Value Chain			
Stages of the Data Value Chain	Data Quality	Data Integrity	Data Use and Interpretation
Data Collection	<p>Are there quality assurance mechanisms or processes that can be used to affirm the quality of the non-traditional data source?</p> <p>Are there internationally recognized and established methods, standards, or guidelines for how the data source can contribute to the production of official statistics?</p>	<p>Are the producers and/or owners of the data source reputable, and do they have a track record of ethical and accountable data production and use?</p>	<p>Are there any factors that might impugn the data source in the eyes of the public? (e.g., Is the data provider driven by political or commercial interests which might be perceived to conflict with those of the NSO?)</p>
Data Publication	<p>Are data being released in clean datasets ready for reuse?</p> <p>Has sufficient metadata and other contextual information been provided to assure users that the underlying data is high-quality?</p>	<p>Have all necessary steps been taken to ensure that any data that is published from the non-traditional source abides by data confidentiality requirements for official statistics?</p>	<p>Are the data being released to the public in ways that are transparent as to their source?</p> <p>Are accessible visualizations being used?</p>
Data Uptake	<p>Have efforts been made to support non-statistical users to understand the steps that have been taken to ensure that data quality has been upheld in the use of the non-traditional data source?</p>	<p>Has sufficient contextual information about the data been released to help users understand its merits and limitations?</p>	<p>Are data being released in line with international standards on open data publication?</p>
Data Impact	<p>Are there mechanisms available for users to provide feedback on the datasets that can help to improve their quality over time?</p> <p>Are there mechanisms in place to accommodate the future amendment of methodology/change of data source without compromising quality?</p>	<p>Are there processes in place to ensure that once data or statistics derived from the non-traditional data source have been released, there is scope for independent verification to ensure that there is no risk of re-identification of individuals or the release of other sensitive data?</p>	<p>Are there appropriate channels for the general public to use, change, or reuse the data in ways that they see fit?</p>

Table 1: Proposed Framework for the Analysis of Trust in the Use of Non-traditional Data Sources for Statistical Production.

CONCLUDING THOUGHTS: NEXT STEPS AND AREAS FOR FURTHER ACTION

This research paper has sought to cultivate a better understanding of the governance factors that improve trust and confidence in the use of non-traditional data sources for official statistical production. While it has not been possible to comprehensively address all of the issues at play, based on a desk-review and substantive experience working with NSOs and entities in the sector, we've produced three case studies exploring the factors that contribute to the engendering of trust in non-traditional sources of data in Ghana, Mexico, and the U.K., and distilled two pre-requisites and three dimensions of 'trust' in official statistics derived from non-traditional data sources from a thorough analysis of the themes that emerged in the case studies. Moreover, by combining these elements with the structure of the Data Value Chain (Open Data Watch 2019), we propose a framework for the analysis of trust in the use of non-traditional data sources for statistical production.

This review has shown how effective legal arrangements can lay the groundwork for trusted uses of non-traditional data sources. While there are some common themes, each of the studied countries has taken a unique approach in response to the local context. In all three countries, though, the NSO has been empowered to coordinate throughout the wider national statistical system, bringing together data from both across and outside government. Combinations of laws and even constitutional requirements have helped establish these expanded abilities along with protections essential to fostering trust in non-traditional data. Priorities for each of the countries may vary, but laws have addressed issues of privacy, confidentiality, quality assurance, and independence. Building on their different legal frameworks, these NSOs have begun to successfully explore and utilize big data sources, from earth observation data and mobile data to administrative data at both the national and sub-national levels. We suggest that these experiences underscore the importance of building trust in the quality of data and in the integrity of statistics, as well as public trust in the presentation of statistics. Moreover, fostering trust requires independence and accountability on the part of NSOs.

This remains a proposed framework, and we intend to explore these ideas in more detail going forward. SDSN TRenDS will look to validate and expand on the framework through discussions with thematic experts, and then apply the framework to select NSOs. We might then attempt a flash survey of NSOs to understand the landscape of practices that are being put into place. While we cannot expect to create a general model for developing trust in statistics, we hope that identifying common elements and other exemplars will help to elevate the discussion and advance practical actions.



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