Assessing and enhancing government data quality, from theory to practice

A 10-step approach to conducting data quality reviews

Working Paper

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'My Rome started to be built today'
- Statement made by a local data producer implying that an important foundation of skills had successfully been laid after a training on assessing and enhancing data quality

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Executive summary

Making the best use of available data

One of the challenges faced in development is that government administrative data can be of mixed quality. **It is thus of heightened importance to understand how to interpret the data that are available. Thus, the question is: which aspects of these data can be used and for what purposes?** A related question is whether there are ways to strengthen local capacity to ensure quality data.

This working paper proposes **a 10-step approach to conducting assessments of the quality of government administrative data across multiple sectors**. Its application is illustrated through real-world examples. The exercise ended in collaboratively strengthening the capacity of local stakeholders. One of the participants declared at the end of a training that 'my Rome started to be built today,' implying that an important foundation of skills had successfully been laid.

We are not the first to find ways to make use of imperfect administrative data. However, we think that we can add valuable insights from our experience of doing so over a period of years.

Getting to an approach that works in practice

The 10-step approach was developed over several years of working on M&E-related aspects of the Millennium Challenge Corporation-funded support to the Government of the Republic of Namibia. As part of this work, **the quality of the government-sourced data that were used for project monitoring was assessed.** The assessment was done by means of data quality reviews (DQRs) of multiple sources of data across multiple sectors.

Through an organic process that was subsequently refined, the DQRs went from asking whether the data sources were 'fit for purpose' to a more nuanced judgement of establishing 'fit for what purpose?' Essentially, the DQRs **sought to answer the following three questions**:

1. 'For what **purpose** do we want to use the data?'

2. 'What does the **process** of producing the data tell us about their fitness for the specified purpose (and for other purposes)?'

3. 'For what purpose(s) are the data fit, and what **actionable steps** could be taken **in this context** to improve on the data's overall quality?'

The 10-step approach to assessing and enhancing data quality

The approach is summarized in the following **10-step framework. It can be applied across a variety of data collection methods and data sources**, particularly in contexts where resource, capacity, and/or circumstantial (such as the current global pandemic) constraints challenge the ability to systemically adhere to strict data quality frameworks.

The three phases in which the steps fall correspond with the three overarching questions that the DQRs sought to answer.

Phase I: Preparatory and planning work – 'For what **purpose** do we want to use the data?'

- Step 1: Clarify agenda for DQA and establish the purpose for which the data are being used

- Step 2: Clarify definitions

- Step 3: Review documentation on the data's creation and use

- Step 4 (iterative): Formulate guiding questions

Phase II: Embarking on a 'voyage of discovery' – 'What does the **process** of producing the data tell us about their fitness for the specified purpose (and for other purposes)?'

- Step 5: Consult data producers to understand the data collection process and the context(s) in which it is carried out

- Step 6: Observe the data collection process in action

- Step 7: Test the data

- Step 8: Cross-check understanding and, if necessary, conduct follow-up consultations

Phase III: Drawing conclusions and developing recommendations – 'For what purpose(s) are the data fit, and what **actionable steps** could be taken **in this context** to improve on the data's overall quality?'

- Step 9: Draw conclusions and identify actionable recommendations

- Step 10: Begin the process of strengthening local DQA capacity in line with local priorities and drawing on existing capabilities

The promise of the 10-step approach

We found that the 10-step approach to DQRs was able to provide results with an effort proportionate to the task and adapted to the reality of data collection on the ground. At the same time, it aimed to strengthen local capacity in a collaborative fashion. The original version of the approach was subsequently incorporated into Namibia's national M&E system. We hope that it thus contributes to broader efforts towards **country-led development and inclusive M&E.**

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List of abbreviations

DQA	Data quality assessment (used interchangeably with DQR)
DQAF	Data Quality Assessment Framework of the IMF
DQR	Data quality review (used interchangeably with DQA)
EMIS	Education Management Information System (EMIS) database at the Ministry of Education (MoE)
FAO	Food and Agriculture Organisation
IMF	International Monetary Fund
M&E	Monitoring and evaluation
MCC	Millennium Challenge Corporation
Meatco	Meat Corporation of Namibia
MoE	Ministry of Education
NSA	Namibia Statistics Agency
UN	United Nations
UNDP	United Nations Development Programme

1   Introduction

1.1   Setting the stage

Government administrative data are used by governments to track progress towards national development objectives, by many development projects in their M&E systems, and by evaluators and researchers as a secondary data source for their studies. However, **it is not always possible – or necessary – to have the highest quality data**, given limited resources, capacity, and a myriad of other contextual factors.

1.2   Making the best use of available data

In a setting where 'working with the data that are there' rather than worrying about 'the data that we would like to have', the question becomes 'are the data still good enough to tell us something?'

We have found **little publicly accessible literature demonstrating the application of data quality assessment tools** that are proven to work in practice across multiple sectors in the reality of a developing world context and that include related capacity-strengthening. This working paper seeks to fill that gap by **proposing a relatively simple-to-apply 10-step approach** to conducting assessments of the quality of government administrative data and providing initial training to increase related capacity. Its **application is illustrated through real-world examples**.

The approach presented herein was originally developed over four years of working with the Millennium Challenge Corporation (MCC)-funded support to the Government of the Republic of Namibia in a Compact to reduce poverty and promote economic growth. Data quality reviews (DQRs) were conducted on various types of data sources in the project's M&E system, including government administrative data. The approach was subsequently refined.

1.3   Why it matters

The authors aim to **contribute to improving data quality and local capacity through an approach** based on a certain degree of pragmatism and flexibility. Such an approach may be applicable to challenging environments when projects are forced to adapt their approach while maintaining quality standards, such as the current global COVID-19 pandemic.

1.4   Outline of the paper

In the next section, we discuss various theoretical frameworks around data quality (the 'theory') before discussing, in the subsequent section, some practical considerations. We then present the 10-step approach for assessing data quality in practice, illustrated by examples (the 'practice').

2   From data quality ideals…

2.1   Defining data quality: principles and theoretical frameworks

2.1.1 Principles, standards, and frameworks

Data quality tends to be defined according to **two main principles**:

1. the **appropriateness** of the data's use in a particular context or for a specific purpose (Karr, Sanil, and Banks, 2006; Laitila, Wallgren and Wallgren, 2011); and

2. the degree to which the data **reflect reality accurately and correctly** (Cerroni, Di Bella, and Galie, 2014; Dekkers, Loutas, De Keyzer, and Goedertier, 2014).

More broadly, **data quality is guided by several international principles and standards that aim to establish ideals for data to achieve**.

For example, the UN General Assembly adopted an updated resolution on the Fundamental Principles of Official Statistics in 2014 (initially adopted in 1994), which enumerates ten principles to guide data quality (UN, 2014).

Box 1:	Fundamental Principles of Official Statistics

Principle 1. Official statistics provide an indispensable element in the information system of a democratic society, serving the Government, the economy and the public with data about the economic, demographic, social and environmental situation. To this end, official statistics that meet the test of practical utility are to be compiled and made available on an impartial basis by official statistical agencies to **honour citizens' entitlement to public information**.

Principle 2. To retain trust in official statistics, the statistical agencies need to decide according to strictly professional considerations, including **scientific principles and professional ethics**, on the methods and procedures for the collection, processing, storage and presentation of statistical data.

Principle 3. To **facilitate a correct interpretation** of the data, the statistical agencies are to present information according to scientific standards on the sources, methods and procedures of the statistics.

Principle 4. The statistical agencies are entitled to **comment on erroneous interpretation** and misuse of statistics.

Principle 5. Data for statistical purposes may be **drawn from all types of sources**, be they statistical surveys or administrative records. Statistical agencies are to choose the source with regard to quality, timeliness, costs and the burden on respondents.

Principle 6. Individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, are to be **strictly confidential** and used exclusively for statistical purposes.

Principle 7. The laws, regulations and measures under which the statistical systems operate are to be **made public**.

Principle 8. **Coordination among statistical agencies** within countries is essential to achieve consistency and efficiency in the statistical system.

Principle 9. The use by statistical agencies in each country of international concepts, classifications and methods promotes the **consistency and efficiency of statistical systems** at all official levels.

Principle 10. **Bilateral and multilateral cooperation** in statistics contributes to the improvement of systems of official statistics in all countries.

Source: UN, 2014.

Various frameworks have been developed for assessing data quality. One of the most frequently cited is the IMF's generic Data Quality Assessment Framework (DQAF), which is rooted in the above-mentioned UN Fundamental Principles of Official Statistics (IMF, 2010). The DQAF's structure is outlined in the box below:

Box 2:   The IMF's Data Quality Assessment Framework

The DQAF covers five dimensions of quality and a set of prerequisites for the assessment of data quality. The coverage of these dimensions recognizes that data quality encompasses characteristics related to the institution or system behind the production of the data as well as characteristics of the individual data product. Within this framework, each dimension comprises a number of elements, which are in turn associated with a set of desirable practices. The following are the statistical practices that are associated with each dimension:

Prerequisites of quality—the environment is supportive of statistics; resources are commensurate with needs of statistical programs; and quality is a cornerstone of statistical work.

Integrity—statistical policies and practices are guided by professional principles; statistical policies and practices are transparent; and policies and practices are guided by ethical standards.

Methodological soundness—concepts and definitions used are in accord with internationally accepted statistical frameworks; the scope is in accord with internationally accepted standards, guidelines, or good practices; classification and sectorization systems are in accord with internationally accepted standards, guidelines, or good practices; and flows and stocks are valued and recorded according to internationally accepted standards, guidelines, or good practices.

Accuracy and reliability—source data available provide an adequate basis to compile statistics; statistical techniques employed conform with sound statistical procedures; source data are regularly assessed and validated; intermediate results and statistical outputs are regularly assessed and validated; and revisions, as a gauge of reliability, are tracked and mined for the information they may provide.

Serviceability—statistics cover relevant information on the subject field; timeliness and periodicity follow internationally accepted dissemination standards; statistics are consistent within the dataset, over time, and with other major data sets; and data revisions follow a regular and publicized procedure.

Accessibility—statistics are presented in a clear and understandable manner, forms of dissemination are adequate, and statistics are made available on an impartial basis; up-to-date and pertinent metadata are made available; and prompt and knowledgeable support service is available.

Source: IMF, 2010, pp. 5-6.

Other examples of data quality frameworks include an approach to understanding the quality of administrative data gathered by government agencies (Iwig, Berning, Marck, and Prell, 2013), a multi-layered approach to data quality monitoring and assessment (FAO, 2004), or key data quality considerations in incorporating administrative data into integrated data systems (Rothbard, 2015).

2.1.2 Applying the principles and frameworks

The data quality frameworks provide a solid basis for data quality assessments. However, they can be **onerous or resource-intensive**, particularly for developing country contexts (Bamberger, Rugh, and Mabry, 2012) or **provide a purely consumer-based approach**, without any specific steps that would help improve the data. In our case we found that one of the qualities of the theoretical frameworks, namely their comprehensiveness, had the unfortunate consequence that they ended up being **too comprehensive to be practical** for meeting the specific objectives of the data quality reviews undertaken.

Accepting that there would be varying degrees of quality in the government data, we assumed that at least some of the data will have a usable level of quality. The challenge and related question then became '**what can be done with the data that *are* produced?**' How this challenge was faced is outlined in the next section.

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3 …to practice: assessing and enhancing data quality in the real world

3.1 From theoretical frameworks to a practical approach

Confronted with this challenge of assessing data quality in a practical manner, we developed **an approach that was more feasible to apply in the context of** the project that serves as the basis for this paper.

In a setting where 'working with the data that are there' rather than worrying about 'the data that we would like to have', **practical considerations take priority over theoretical ones**. When we assume potentially flawed data, the question becomes 'are the data still good enough to tell us something?' and, if so, what? Thus, it is less about the gap between the reality and the ideal and more about determining whether there are parts of the data that can be used for specific purposes. This can then be followed by providing actionable recommendations aimed at enhancing the data's overall quality and beginning the process of strengthening related local capacity.

Before outlining the approach, however, it may be helpful to know more about the data sources that were assessed for quality and the process the DQRs/DQAs followed.

3.2 Data sources and DQR process

As stated earlier, **the quality of the government administrative data[1] that were used to inform progress towards the goals of the MCC Compact with Namibia was assessed by means of DQRs**. The DQRs covered the data collection practices and resultant data from multiple government sources in the education, agriculture, land, and tourism sectors.

Box 3: Data sources reviewed for quality
• Education Management Information System (EMIS) database at the Ministry of Education (MoE)
• MoE's Directorate for National Examinations and Assessment
• Ministry of Environment and Tourism's Directorate of Tourism and Directorate of Parks and Wildlife
• Namibian Tourism Board
• NamLITS (which is Namibia's livestock traceability system) database at the Ministry of Agriculture, Water and Land Reform
• Meat Corporation of Namibia (Meatco)
• Namibia Statistics Agency (NSA) (and its predecessor, the Central Bureau of Statistics)
• Ministry of Labour and Social Welfare's Labour Force Survey
• Namibian Communal Land Administration System in the Ministry of Lands and Resettlement
• National Training Authority

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[1] Administrative data are a particular type of secondary data are, which are 'derived from the operation of administrative systems' (Elias, 2014 cited in Connelly, Playford, Gayle and Dibben, 2016: 3). Most often these administrative systems refer to public sector agencies (Elias, 2014), but are not necessarily nor exclusively so. (Efforts to incorporate public administrative data into national 'official' statistics (see, for example, Cerronni, Di Bella, and Galie, 2014) have been noted.)

The assessment covered both the documented (and sometimes undocumented) data collection procedures and the implementation of those procedures.

Though there was a common overall approach to assessing the quality of each data source, the specific methods and related activities used varied according to the data source. This specification was necessary as **each source had its own processes for collecting and compiling data**. It was an important feature of the DQRs/DQAs, given the diversity of the data sources that were reviewed, as well as the extended period over which the assessments were conducted.

At the outset, the DQRs were aimed at understanding, in detail, the processes that underpinned data collection and reporting for the reviewed data sources with a view to deeming them either (a) sufficiently robust to be 'fit for purpose' or (b) featuring too many weaknesses that would challenge the data's quality and integrity and thus not be 'fit for purpose' (Riemenschneider and McConnell, 2014).

Through an organic process that was further refined following additional reflection, the DQAs' judgments began to answer a more nuanced question '**fit for what purpose?**' before considering what could be done to improve data quality.

In sum, **the DQRs sought to answer the following three questions**:

1. 'For what **purpose** do we want to use the data?'

2. 'What does the **process** of producing the data tell us about their fitness for the specified purpose (and for other purposes)?'

3. 'For what purpose(s) are the data fit, and what **actionable steps** could be taken **in this context** to improve on the data's overall quality?'

4 The 10 steps of a practical approach to assessing data quality

4.1 The 10 steps at a glance

The approach is summarized in the following 10-step process which can be applied across a variety of data collection methods and data sources, particularly in contexts where resource, capacity, and/or circumstantial (such as the current global pandemic) constraints challenge the ability to systemically adhere to strict data quality frameworks.

The three phases in which the steps fall correspond with the three overarching questions that the DQRs sought to answer.

Phase I: Preparatory and planning work – 'For what **purpose** do we want to use the data?'

- Step 1: Clarify agenda for DQA and establish the purpose for which the data are being used

- Step 2: Clarify definitions

- Step 3: Review documentation on the data's creation and use

- Step 4 (iterative): Formulate guiding questions

Phase II: Embarking on a 'voyage of discovery' – 'What does the **process** of producing the data tell us about their fitness for the specified purpose (and for other purposes)?'

- Step 5: Consult data producers to understand the data collection process and the context(s) in which it is carried out

- Step 6: Observe the data collection process in action

- Step 7: Test the data

- Step 8: Cross-check understanding and, if necessary, conduct follow-up consultations

Phase III: Drawing conclusions and developing recommendations – 'For what purpose(s) are the data fit, and what **actionable steps** could be taken **in this context** to improve on the data's overall quality?'

- Step 9: Draw conclusions and identify actionable recommendations

- Step 10: Begin the process of strengthening local DQA capacity in line with local priorities and drawing on existing capabilities

4.2 Describing the 10 steps and applying them in an illustrative example

The descriptions below of each of the 10 steps are illustrated using the example of tourism data, with references to additional examples where we thought this would enhance understanding.

Phase I: Preparatory and planning work – 'For what **purpose** do we want to use the data?'

Step 1: Clarify agenda for DQA and establish the purpose for which the data are being used

The first points to look at are as follows:

- **Clarify the agenda for doing a DQA**. Determine what motivated the DQA. Is it a routine exercise to which all data sources of a particular project are subjected? Are there specific suspected concerns about the data that prompted the review and, if so, what are they? These factors influence the approach from the outset and help to focus the DQA.

- **Define the purpose for which the data in question are to be used**: Is it to provide information on which national policy will be based? Is it to monitor the results of a programme over time? Is it to get a rough idea of a situation in a particular area? Is it to provide a trend over time? This will determine how accurate the data will need to be and in which areas it is particularly important to be rigorous. This will also determine the depth and focus of the DQA.

- As is the case with most secondary date, the purpose for which the data in question are to be used is not necessarily the same as the initial purpose for which the data were collected. Data may be collected for one reason but turn out to be useful for something else.

- **Acknowledge bias**. As a function of clarifying the agenda, a further component is to reflect on potential biases. These might be related to preconceived notions about the data or the context in which they are produced. They may be the motivating factor to embark on the DQA in the first place. Regardless of the source of bias, it is important to acknowledge it and, in so doing, attempt to mitigate its effect.

The above activities are typically done through initial stakeholder consultations. The stakeholders in this instance are not only those commissioning the DQR but also those who have any influence over or role in the use of the data being assessed.

Box 4: Example of step 1
The first step of each review entailed discussions with key MCA-N staff, given that MCA-N commissioned the data quality reviews. These exchanges often involved reviewing the Compact's theory of change. This helped to understand the purpose served by the indicators whose data was to be quality-reviewed.
One example relates to improvements that the MCA-N project made to the country's flagship national park. The purpose of these improvements was to attract more visitors. Accordingly, MCA-N was keen to find out whether tourist visits increased. There was an indicator measuring the number of tourist visits to national park. The question for the DQR was whether this indicator measured increase in visits accurately. As will be seen later, establishing this purpose of the data use was key to informing the DQR's methods and recommendations.

Step 2: Clarify definitions

The definitions of key terms related to the data and the data source need to be clear. Definitions determine parameters which have direct bearing on the methods employed in the DQR as well as on the conclusions drawn and the recommendations made. If there are inconsistent interpretations of key terms, this is key to note as well. The assessment of quality of the associated data will also depend on the definition applied.

Box 5:   Example relating to step 1 and step 2

In the example of tourist visits to Namibia's flagship park, an indicator used as a proxy for visits was park revenue. The indicator definition initially included revenue from park gate receipts and revenue from concession fees. However, it turned out that concession fees were not directly related to park visitation. The DQR team recommended to exclude the concession fees from the indicator as it blurred the understanding of trends in park visits. Making this recommendation was possible due to the knowledge of the purpose of the data and clarification of the related definitions.

Related considerations for the recommendation were that concession fees were not always straightforward to distinguish by park and made up only 5% of total revenue. The recommendation enhanced data quality by ensuring a more precise reflection of what the indicator was meant to measure.

Step 3: Review documentation on the data's creation and use

Generally, some form of **documentation** should exist **around the purpose for the collection of the data in question** (which is not necessarily the same as its use) **and how data systems or processes work or are supposed to work**. Some of the key documents to consider include those describing data collection processes, data collection tools designed to collect the data, sampling methods used, and data management.

However, the **lack of documentation does not necessarily imply lack of data quality**. In our work, we found cases where data had been collected and checked systematically, while the process had not been written down.

Box 6:   Examples of step 3

Example of lack of documentation: In the tourist visitation example, the DQA team did not have a significant amount of documentation to review prior to heading to the field (in Phase II of the review). However, this had no relation to the quality of the data. Instead, the field visit mattered more in order to understand the process.

Example of extensive documentation: As a supplementary illustrative example, the DQRs of the MCA-N program included a review of data produced by the Namibia Statistics Agency (NSA). Given the large scale and significance of their data collection processes – for the National Household Income and Expenditure Survey (NHIES), for example – this step found that the procedures and related data collection instruments were extensively documented in manuals and other reference files. This thorough documentation, along with findings made in later steps of the data quality review, contributed to the review's ultimate finding that the NHIES was 'generally of high quality and its results...reliable'.[2]

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[2] Ultimately, minor recommendations were made for areas where the survey could be improved. These included matters such as reduced number of households per enumeration area; improving the sample size per region so that the sample can be disaggregated at a regional level; calculating sampling errors for key variables; making minor improvements to the questionnaire; using price deflators to standardise costs in estimating value of total consumption for households; calculating poverty based on the cost of basic needs (not by food shares); and using double data-entry for certain complex sections of a question in order to reduce data capture errors where double-entry is not possible for the full questionnaire. (Riemenschneider and McConnell, 2014) A related training was conducted for the data producers early on in the implementation of the MCA-N program.

Step 4 (iterative): Formulate guiding questions

The next step in conducting a DQA using the approach developed is that of formulating questions to guide the rest of the review. These questions will be informed by and follow on from the preceding steps. The questions target the information needed to determine whether the data are fit for the specified purpose. Ultimately, **these questions will focus the exercise and set priorities as it unfolds**.

It is important to note that subsequent steps in the review will lead to new questions to be addressed. In essence, as the data production processes become clearer to the reviewer, further questions arise. Naturally, there are limits as to what can be followed up upon, and the effort needs to be proportional to the purpose *and* resources of the DQR. Hence, it is useful to **revisit step 4 at regular intervals during the review exercise**. Status-checks help decide how the remainder of time and resources should be spent.

Box 7:	Example of step 4

In the case of the tourism data used in MCA-N's M&E system, the main question for one of the reviews was to understand the data collection process at one of the four park gates and how it related to that at other gates.[3] At a later point the question was about how data were collected, recorded and communicated, how data from different gates were consolidated, and how the data were reconciled vis-à-vis vehicles entering and leaving the national park.[4]

Phase II: Embarking on a 'voyage of discovery' – 'What does the **process** of producing the data tell us about their fitness for the specified purpose (and for other purposes)?'

After having performed the steps in Phase I, the second, more 'active' phase of the assessment exercise begins. Here, the DQR can be compared to a 'voyage of discovery', given that fieldwork is involved and what will be found is, *a priori*, unknown. For example, in cases where personnel involved in the data production are knowledgeable and open about data risks, and conduct double and triple checks to ensure quality, then the assessment is straightforward. In cases where there are capacity constraints and data providers feel like they are being audited, it can be much more time- and energy-intensive to conduct the DQR.

Step 5: Consult data producers to understand the data collection process and the context(s) in which it is carried out

To properly understand how the data collection process works, it is essential to **talk to those who are involved in the related activities on an ongoing basis, working amidst the challenges and difficulties that a part of the data collection**. These are realities that underpin data – human beings gather them, often in the context of severe resource and capacity constraints and a host of conflicting demands as they generate, collate, maintain, manage, and disseminate them. And this all occurs in real-life situations.

To assess the quality of the data, it is imperative to firstly **understand these realities and processes well before any determination of quality can occur**.

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[3] 'The question is whether procedures are in place to count visitors entering and exiting the gate, and whether these procedures are in line with and integrated into the procedures that count visitors at the Anderson and von Lindequist gates.' (Riemenschneider, McConnell, and Megill, 2012)

[4] 'The main question for this indicator is how the data are collected and how records are kept. Furthermore, how are the data then communicated or reported on? In particular, how are the records from each gate consolidated into a single data base, and how are they reconciled between gates vis-à-vis vehicles entering and leaving the Park, in order to ensure quality reporting?' (Riemenschneider, McConnell, and Megill, 2014)

Therefore, in this step, **the guiding questions established in step 4 are posed to the stakeholders responsible for gathering, collating, managing, and disseminating the data** as well as anyone else who has a role in the creation of the data under review.

These consultations should generally be conducted **at the point of operation** – that being where the stakeholder carries out her or his specific role in producing the data. This allows not only for discussion in an environment familiar to the respondent, but also facilitates the demonstration and observation of the data collection processes themselves.

At this juncture, it is particularly important to establish a non-threatening atmosphere, one in which data producers do not feel audited, but rather **feel that they can talk about the process as it happens, with strengths and shortcomings, in a collaborative spirit**. The expectation that a DQR team is de facto an auditor can be strong, and it may require several efforts to counter it. It can be useful to emphasize that this is an opportunity to share challenges faced and ideas for improvement, as the DQR team will be able to report those and thereby increase understanding for the situation on the ground and what can be done about it.

Understanding the process is essential for drawing out accurate information to feed into the conclusions of the review as well as appropriate details to take into consideration when drafting actionable recommendations for improvement.

In circumstances where in-person consultations are not feasible, this step can be undertaken remotely. If technology and network coverage permit, this can be done via web-based meeting platforms. Where this is not possible, other communication alternatives such as phone and text could be considered.

Box 8:	Example of step 5
In the example of the indicators aimed at measuring visitation to Namibia's flagship park, it was found that the revenue data was carefully collected and double-checked by the relevant personnel, making it of high general-use quality. However, when it came to reporting the headline figures to MCA-N, some of the data appeared to be incomplete. The review found that this was because providing data to MCA-N was an additional task beyond the well-maintained revenue reporting system. Hence, introducing a simplified tool for reporting to MCA-N would be sufficient.	

Step 6: Observe the data collection process in action

By conducting in-field consultations with stakeholders and carrying out congruent **observations of the data collection processes**, the DQR benefits from real-life exposure to the data collection processes themselves. This is important in further illuminating the associated challenges and realities.

It is also helpful to keep in mind that **if there are multiple data collection points, the processes may not be the same for each one**. The greater the number of data collection points and the higher the variability in the approach at each one, the greater the potential for quality discrepancies in the data. The field observations help the data quality assessor appreciate each component of data collection in the context of its practical realities and deduce from there which interpretations of the data are appropriate.

Box 9:   Example of step 6

Following on from the examples presented above, to understand the process of producing the national park's visitor and revenue data, the DQR team conducted field observations of how the raw data was collected at selected gates leading into the park. It was found that multiple systems (usually paper-based) were in place to record data, sometimes even at the same gate. The method used seemed to depend on a combination of capacity, habit, and availability of the relevant forms. It took some time to establish this, as well as to determine the implications for the reliability of the resulting data. It would have been challenging to determine this efficiently in the absence of direct observation.

Opportunities to undertake this step remotely increase with the advances in technology, such as is needed in the context of a global pandemic as is the case in the current COVID-19 era.

Step 7: *Test the data*

The activity in this step involves obtaining **access to the raw dataset and testing whether the data provide consistent information and match what has been previously reported**.

In an electronic data management system, for example, it should be possible to check the logic behind the compilation of the data and verify whether important information may be missing or double counted. In a dataset it is also possible to check whether data is structured in a consistent format, whether there are missing data points, and so on. This step aligns with the data cleaning process that often occurs during electronic data capture.

In cases where data are paper based, the sample data to be tested could be entered into electronic format (if the data assessor has a laptop, for example) or spot-checked manually. In both cases, data can also be tested by coming up with one or more example cases and running them through the data collection, collation, management, and reporting system. This is a means to understanding the process and its strengths and weaknesses.

Box 10:   Example of step 7

At some of the gates in the national park mentioned in the previous step, revenue data was captured in cash books and summed up across a page before being reported. These cash books were reviewed in some detail as the DQR team 'followed' the calculations, ensuring that they understood which number gets reported where and for what purpose, so as to be sure that there is no double- or under-counting.

Phase III: Drawing conclusions and developing recommendations – 'For what purpose(s) are the data fit, and what **actionable steps** could be taken **in this context** to improve on the data's overall quality?'

At this point, substantial progress will have been made towards answering the guiding questions established in step 4, either initially or when that step was revisited at regular, frequent intervals, as suggested. This forms the basis for an iterative process towards drawing conclusions and developing recommendations.

Step 8*: Cross-check understanding and, if necessary, conduct follow-up consultations*

Before drawing final conclusions, it is useful to:

- **obtain feedback on any remaining questions critical to the DQR.** Often there may be lingering questions from the preceding step of testing the data; data cleaning processes, for example, often bring up issues that require clarification such as issues with data collection tools or their administration or inconsistent response coding, among others; and

- **share preliminary findings with stakeholders**, together or separately, to sense-check understanding of the data production and use and to present initial conclusions.

The two activities can take place in a single session, depending on who is in attendance (as well as taking into consideration any other relevant factors). During this process, further questions may arise that could require further consultation. This follow-up should be done in proportion to the purpose and resources of the DQR.

Box 11:   Example of step 8

In the context of the DQAs for the MCA-N project, presentations were made by the reviewers to MCA-N staff and the relevant data producers and users at the close of each DQR mission. This was a means of sharing preliminary findings and ensuring accurate understanding of the processes and reasonable premises for recommendations. The input provided formed part of an iterative process in the finalization of recommendations. The objective was to identify recommendations that were pragmatic and viable for implementation which were also aligned with the overall objectives of the MCA-N Compact.

As a case in point, MCA-N's M&E logframe initially included an indicator on the learner:textbook ratio. The logic behind the indicator was that this ratio would improve, thanks in part to the project's provision of new textbooks to Namibian schools. The underlying assumption was that a lower learner:textbook ratio would equate to improved learning outcomes. An early finding in the review was that the data collected by and reported through the Education Management Information System did not distinguish between old and new textbooks, and thus risked including outdated textbooks and skewing the ratio. The preliminary conclusion was that the indicator was not fit for the specified purpose, with the related recommendation that it be dropped from the MCA-N logframe. The exchange in the presentation of preliminary findings confirmed this understanding, and the indicator was indeed subsequently deleted from the M&E indicator tables. It is important to note, however, that this conclusion was specific to the purpose of the collection of the data in question, as the data may still have been useful for other purposes.

In sum, this created the opportunity to raise final questions and address outstanding issues while the assessment team was still in-country. This enabled a richer exchange and the possibility of conducting further observations and in-person consultations, if necessary. Importantly, this often meant revisiting the Compact's theory of change to confirm the logic behind the measures.

Step 9*: Draw conclusions and identify actionable recommendations*

The main task in this step is to **develop conclusions about which interpretations of the available data are appropriate for the given purpose**. Some aspects of the data will be weak; the challenge is to weigh the weaknesses against the strengths and determine whether the data are sufficiently robust for the specified purpose. Guided by the questions established at the outset and a good understanding of the process, **it is possible to**

determine which interpretations of the data are possible and which enhancements to improve data quality would be feasible.

For example, sometimes a trend is more important than the absolute value. If so, and **as long as any omissions in the data are consistent over time, even 'inaccurate' data can provide useful indications of trends**. If the context does not allow for the necessary improvements to be made, changing the data production system may not be an immediate priority.

It is important to emphasize here that, **where it is appropriate to make recommendations, suggestions for how the process can be improved should be actionable in the given context**. It is easy to suggest that more resources or capacity be devoted to the data production process; it is much harder to **provide recommendations that can readily be implemented in resource- and capacity-constrained contexts and that also appreciate the efforts already undertaken**. Moreover, unless they are strictly data producers, the people who generate the raw data often have a different core function, such as herding animals, teaching children, or caring for sick people. Producing data may be a required but ancillary task, rather than a primary responsibility. It may be carried out under severe time constraints. Accordingly, there may be little that can realistically be changed.

All this needs to be taken into account when drawing conclusions and making recommendations. **The approach to DQRs that was developed is, by definition, one that places priority on pragmatism and parsimony**. Dropping an indicator from a project's M&E framework may be more practical than attempting to perfect the related data source.

Box 12:   Example of step 9

In the case of revenue data for Namibia's national park, one option was to suggest simplifying the data recording tool as a means toward enhancing data quality. However, at the time, there was already discussion of introducing an electronic payment system. The DQR report supported this idea by recommending it as well, rather than creating a separate, additional burden in the meantime.

Step 10: *Begin the process of strengthening local DQA capacity in line with local priorities and drawing on existing capabilities*

The DQA should not end at providing recommendations; it extends to engaging stakeholders in implementing those recommendations in a manner that is aligned with the data producers' own aspirations and mindful of the realities on the ground.

The strengthening of local capacity should, therefore, be done **in partnership with the key staff and management teams involved in the production of data for a given data source**. This helps ensure that the support provided is aligned with the producer's priorities and with, for example, the human resource strategy and staff members' professional development plans. Wherever possible, expertise that exists within the data production teams or within the country should be drawn on. This helps raise the profile of those who would be able to provide follow-on support.

Box 13:   Example of step 10

In the case of the DQRs for the MCA-N project, a short training for staff from the then-Central Bureau of Statistics (now the Namibia Statistics Agency) was conducted early on during the implementation period. This training was jointly led by the DQR team and a long-term member of the bureau's staff corps. Though this individual's position with the data producer had been financed through the United Nations Development Programme (UNDP),

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at least initially, drawing on this locally based capacity ensured that existing resources were used for their intended purpose. Taking this approach also enabled the identification of high-capacity staff members to potentially play technical leadership roles on the agency's team.

Subsequent support was provided to selected Namibian government officials[5] not only to enhance their capacity to implement the recommendations but also to conduct their own data quality assessments. The workshop-style sessions were tailored to the audience and kept participants actively engaged as they leaned into the collaboration to improve their data. Importantly, the training participants themselves confirmed the achievement of the workshop's goals, with one trainee marvelling that '**my Rome started to be built today**' to describe the significance of the foundation of skills that had been laid.

4.3   The promise held by the 10-step DQR approach

In sum, we found that the 10-step process addresses a range of challenges generally faced in DQA exercises as well as those specific to resource- and capacity-constrained contexts. The approach was **able to deliver results with an effort proportionate to the task and adapted to the reality of data collection on the ground, while drawing on and strengthening local capacity**.

In this way, the approach may contribute to efforts towards **country-led development** and **inclusive M&E**.

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[5] The audience of the original 10-step process training consisted of key government officials in the National Planning Commission's Directorate of Monitoring and Evaluation and those from the institutions whose data was assessed, particularly the Namibia Statistics Agency and Ministry of Labour and Social Welfare. The officials were largely made up of M&E professionals, statisticians, and economists.

5   Conclusion

The work reflected in this article has **sought to document an approach on how to bridge the gap between theory and practice in assessing and improving quality of government administrative data across multiple sectors**.

Grounded in internationally accepted principles and frameworks of data quality, it **starts from an understanding of the use to which the data is put. It offers a simple-to-apply 10-step process** for conducting assessments of the quality of government administrative data for the purposes of making the best use of available data. The approach is **designed to be pragmatic** in its required level of effort and has proven to be applicable and adaptable across a variety of data sources and types.

Furthermore, the application of this approach in a large and complex development project and an indication that minimal training can build the confidence of local stakeholders to apply it, suggests that **the approach may be applicable in other contexts**.[6] For example, its original version was subsequently incorporated into Namibia's national M&E system. Some donors provide support to governments to improve their data production and use systems, either as a standalone project or in parallel with other support. Therefore, this approach may be of interest to donors and governments alike.

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[6] Future research could build on the work presented in this article by investigating the application of the framework in other countries and/or on different projects. As with any framework, it is important to consider when and how its features are applied in each case, as this can have bearing on the conclusions reached. Such work would provide useful insights on the extent to which further refinement may be necessary, in line with prevailing and new theories.

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