CHAPTER VIII. DATA QUALITY AND METADATA

A. Enhancing data quality of distributive trade

8.1. *Quality measurement of distributive trade statistics*. Data on distributive trade statistics are the end product of a complex process comprising many stages from the collection and processing of data to compilation and dissemination of statistics. Quality measurement of distributive trade statistics is concerned with providing the user with sufficient information to judge whether or not the data are of adequate quality for their intended use, i.e. to judge their "fitness for use". For example, data users must be able to verify that the conceptual framework and definitions that would satisfy their particular data needs are the same as, or sufficiently close to those employed in collecting and processing the data. Users need also to be able to assess the degree to which the accuracy of the data is consistent with their intended use or interpretation. All the measures that a statistical office takes to assure quality of statistical information constitute a quality management.

8.2. *Data quality assessment frameworks*. Most international organisations and countries[1] have developed definitions of quality, outlining the various dimensions (aspects) of quality and quality measurement and integrated them into quality assessment frameworks. Although the existing quality assessment frameworks differ to some extent in their approaches to quality and number, name and scope of quality dimensions (see Box 4 for reference[2]) they compliment each other and provide comprehensive and flexible structures for the qualitative assessment of a broad range of statistics.

(a) The *IMF Data Quality Assessment Framework (DQAF)* takes a holistic view of data quality and includes governance of statistical systems, core statistical processes and statistical products. The Framework is organised in a cascading structure covering the prerequisites and five dimensions of quality – assurance of integrity, methodological soundness, accuracy and reliability, serviceability and accessibility.

(b) The *European Statistical System (ESS)* focuses more on statistical outputs and defines the quality of statistics with reference to six criteria – relevance, accuracy, timeliness and punctuality, accessibility and clarity, comparability and coherence.

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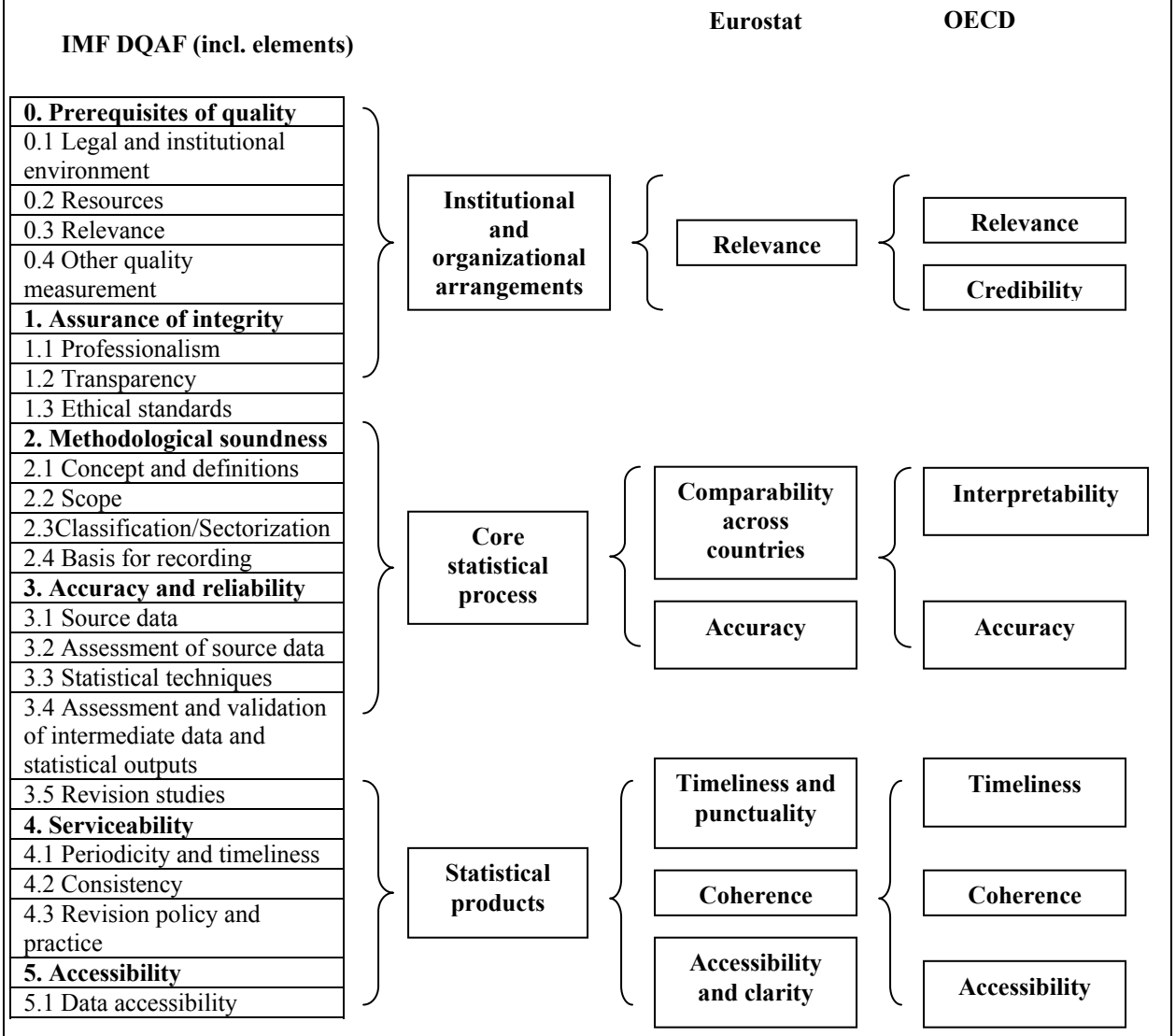
[1] IMF Data Quality Assessment Framework - http://dsbb.imf.org/Applications/web/dqrs/dqrsdqaf/; Eurostat, "Assessment of quality in statistics - Definition of Quality in Statistics", Working Group, Luxembourg, October 2003; OECD, "Quality Framework for OECD Statistics", Paris, June 2002 UK Office for National Statistics Guidelines for Measuring Statistical Quality, Statistics Canada's Quality Assurance Framework , Statistics Finland's Quality Guidance for Official Statistics etc.

[2] Source Data Quality: A Comparison of IMF's Data Quality Assessment Framework (DQAF) and Eurostat's Quality Definition – Licie Laliberte (IMF), Werner Grunewald, and Laurent Probst (Eurostat), January 2004. The last column showing the relationship with the OECD Quality Measurement Framework is by the UNSD.

(c) The *OECD Quality Measurement Framework* views quality as a multi-faceted concept. Likewise Eurostat approach, the quality characteristics depend on user perspectives, needs and priorities, which vary across groups of users. The quality is viewed in terms of seven dimensions – relevance, accuracy, credibility, timeliness, accessibility, interpretability and coherence.

Box 3. Relationship between IMF DQAF, Eurostat Quality Definition and OECD Quality Measurement Framework



8.3. The overall aim of the three quality assessment frameworks is to standardise and systematise statistical quality measurement and reporting across countries. They allow an assessment of national practices to be made against internationally (or regionally) accepted statistical approaches for quality measurement. The quality assessment frameworks could be used in a number of aspects, including for (i) guiding countries'

efforts for strengthening their statistical systems by providing a self-assessment tool and for identifying areas of improvement; (ii) technical assistance purposes; (iii) reviews of particular statistical domains performed by international organization; and (iv) assessment by other groups of data users.

8.4. *Dimensions of quality.* National statistical offices can decide to implement one of the existing frameworks for quality assessment of any type of statistics, including distributive trade statistics, either directly or develop on their basis national quality assessment frameworks that fit best their countries practices and circumstances. The following dimensions of quality should be taken into account in developing quality assessment frameworks for measuring and reporting the quality of statistics in general and distributive trade statistics in particular – prerequisites of quality, relevance, credibility, accuracy, timeliness, methodological soundness, coherence, and accessibility. They form a broad view of quality and as such participate in most of the existing frameworks.

(a) *Prerequisites of quality*. Prerequisites of quality refer to all institutional and organizational conditions that have an impact on the quality of distributive trade statistics. The elements within this dimension include the legal basis for compilation of data; adequacy of data sharing and coordination among data producing agencies; assurance of confidentiality; adequacy of human, financial, and technical resources for implementation of distributive trade statistics programmes and implementation of measures to ensure their efficient use; and quality awareness.

(b) *Relevance.* The relevance of distributive trade statistics reflects the degree to which it meets the real needs of users. Therefore, measuring relevance requires identification of user groups and their needs. The statistical offices should balance the different needs of current and potential users to produce a program that goes as far as possible in satisfying the most important needs of users for both coverage and content of distributive trade data given the resource constraint. The indicators of relevance are the requests of users, conducted users' satisfaction surveys and their results, the identified gaps between key user interests and compiled distributive trade statistics in terms of concepts, coverage and details.

(c) *Credibility*[3]. The credibility of distributive trade statistics refers to the confidence that users place in those data based on the image of the statistical office or agency that produces the data. Confidence by users is built over time. One important aspect of credibility is the trust in objectivity of the data. This implies that the data are perceived to be produced professionally in accordance with appropriate statistical standards, and that policies and practices are transparent. For example, data should not be manipulated, nor their release should be timed in response to political pressure (see Box 1, Principle 2).

(b) *Accuracy.* The accuracy of distributive trade statistics is the degree to which the data correctly estimate or describe the quantities or characteristics they are

[3] This dimension is referred to as assurance and integrity in IMF DQAF

designed to measure. It has many attributes and in practice there is no a single aggregate or overall measure of accuracy. In general, it is characterized in terms of errors in statistical estimates and is traditionally decomposed into bias (systematic error) and variance (random error) components, but also it includes description of any processes undertaken by statistical offices to reduce measurement errors. In the case of sample surveys-based distributive trade estimates, the accuracy can be measured using the indicators: coverage, sampling errors, non-response errors, response errors, processing errors, measuring and model errors. Revisions and revision studies of distributive trade statistics undertaken at regular intervals are considered as a gauge of reliability.

(c) *Timeliness*. The timeliness of distributive trade statistics refers to the amount of time between the end of the reference period to which the data pertain, and the date on which the data are released. The concept of timeliness applies equally to short-term and structural data as the only difference is the timeframe. Timeliness is closely related to the existence of a publication schedule. A publication schedule may comprise a set of target release dates or may involve a commitment to release distributive trade data within prescribed time period from their receipt. This dimension is usually involved in a trade-off against accuracy. The timeliness of information also influences its relevance. Punctuality is another aspect of timeliness. It shows the amount of time between the identified release data and the effective dissemination data of distributive trade data.

(d) *Methodological soundness*. The methodological soundness is a dimension that refers to the application of international standards, guidelines and good practices in production of distributive trade statistics. The adequacy of the definitions and concepts, target populations, variables and terminology, underlying the data, and information describing the limitations of the data, if any, largely determines the degree of adherence of a particular dataset to international standards. The metadata provided along with distributive trade statistics play a crucial role for assessing the methodological soundness of data. They inform the users on how close to the target variable (for example any of the data items) the input variables used for their estimation are. When there is a significant difference, it should be explained to what extent this may cause a bias in the estimation of data items. The methodological soundness is closely related to the interpretability of data. The interpretability depends on all aspects of information on distributive trade data mentioned above. It reflects the ease with which the user may understand and properly use and analyze the data.

(e) *Coherence.* The coherence of distributive trade statistics reflects the degree to which the data are logically connected and mutually consistent, i.e. they can be successfully brought together with other statistical information within a broad analytical framework and over time. The use of standard concepts, classifications and target populations promotes coherence, as does the use of common methodology across surveys. Coherence does not necessarily imply full numerical consistency. Coherence has four important sub-dimensions:

(i) *Coherence within a dataset* implies that the elementary data items are based on compatible concepts, definitions, and classifications and can be

meaningfully combined. For distributive trade statistics this sub-dimension means that all data items are compiled on the methodological basis of the recommendations presented in the IRDTS.

(ii) *Coherence across datasets* implies that the data across different datasets are based on common concepts, definitions and classifications. The coherence between distributive trade statistics and industrial statistics and then with national accounts will be ensured if all data sets are based on common concepts, definitions, valuation principles, classifications etc., or that any differences are explained and can be allowed for.

(iii) *Coherence over time* implies that the data are based on common concepts, definitions, and methodology over time. This property will be achieved if, for example, an entire time series of distributive trade data is compiled on the basis of the recommendations in the IRDTS. If this is not the case, it is advisable that countries clearly note the differences from the recommendations.

(iv) *Coherence across countries* implies that the data are based on common concepts, definitions, and methodology across countries. Coherence of distributive trade statistics across countries may be dependent upon the degree of adoption of recommendations in the IRDTS..

(f) *Accessibility.* The accessibility of distributive trade statistics refers to the ease with which they can be obtained from the statistical office. This includes the ease with which the existence of information can be ascertained, as well as the suitability of the form or the media of dissemination through which the information can be accessed. The aspects of accessibility are also the availability of metadata and the existence of user support services. Accessibility requires development of an advance released calendar (see para. 10.13) so the users will be informed well in advance on when the data will be available, where and how to access them.

8.5. These dimensions of quality are overlapping and interrelated and as such form a complex relationship. An action taken to address or modify one aspect of quality will tend to affect other elements of quality. For example, there may be a trade-off between aiming for the most accurate estimation of the total annual turnover of trade units, and providing it in a timely manner when this information is still of interest to the users. It is recommended that if countries are not in a position to meet simultaneously the accuracy and timeliness requirements while compiling a particular distributive trade statistics dataset, a provisional estimate, which is available soon after the end of the reference period but which is based on less comprehensive data content, should be produced. This estimate is supplemented at a later date with information that is based on more comprehensive data content but which is less timely than its provisional version. If there is no conflict between these two quality dimensions, there would be no need of producing both estimates.

8.6. The measurement of quality of any statistical data, including distributive trade statistics data, is not a simple task. The problems arise from the difficulties in quantifying the level of individual dimensions and in aggregating the levels of all dimensions. By reason of these deriving a single quantitative measure of quality is not possible. In the absence of such a single measure countries are encouraged to use a system of quality measures/indicators (see the section B below) and develop their own quality assessment frameworks based on the above mentioned approaches and dimensions and the specific circumstances in their economies and to regularly issue quality reports as part of their metadata. The quality framework allows statistical offices for a practical approach to providing data that meet different users' needs, while the provision of quality information allows users to judge for themselves whether a dataset meets their particular quality requirements. It is recommended that a quality review of distributive trade statistics be undertaken every four to five years or more frequently if significant methodological changes or changes in the data sources occur.

B. Quality indicators versus direct quality measures

8.7. *Quality measures.* Quality measures are defined as those items that directly measure a particular aspect of quality. For example, the time lag from the reference date to the release of particular distributive trade statistics is a direct quality measure. However, in practice many quality measures can be difficult or costly to calculate. Instead quality indicators can be used in quality measurement. Quality measures and quality indicators can either supplement or act as substitutes for the desired quality measurement.

8.8. *Quality indicators*. Quality indicators are summarized quantitative data that provide evidence about the quality or standard of the data produced by national and international statistical agencies. They are linked to the achievement of particular goals or objectives. Unlike ordinary raw statistics, quality indicators are generally conceptualized as having some reference point and as such, can assist with making a range of different types of comparisons.

8.9. Quality indicators usually consist of information that is a by-product of the statistical process. They do not measure quality directly but can provide enough information for the assessment of a quality. For example, in the case of accuracy it is almost impossible to measure non-response bias as the characteristics of non-responders can be difficult and costly, to ascertain. In this instance, response rate is often used as a proxy quality indicator which provides a measure of the possible extent of non-response bias.

8.10. It is not the intention that all quality dimensions should be addressed for all data. Instead, countries are encouraged to select those quality measures/indicators that together provide an assessment of the overall strengths, limitations and appropriate uses of a given dataset. Some types of quality measures and indicators will be produced for each data item, for example item response rate of total turnover (see data item 5.1) would be

calculated with each new estimate. Alternatively, some others would be produced once for all data items and would be re-written only if there are changes. An example of the latter case is the description of survey approaches to data collection (see para. 9.4. (vi)) for the quality dimension "methodological soundness") which would be applicable to all distributive trade statistics data items.

8.11. *Defining quality indicators*. When countries define the quality indicators for distributive trade statistics it is recommended that they satisfy the following criteria: (i) cover part or all of the dimensions of quality as defined previously; (ii) the methodology for their compilation is well established; and (iii) the indicators are easy to interpret.

8.12. *Types of quality indicators*. According to their importance the quality indicators can be classified as:

(a) *Key indicators* that ought to fulfil the criteria in para. 9.11. Examples of key quality indicators are the coefficient of variation, measuring the accuracy of distributive trade statistics obtained through sample surveys and the time lag between the end of the reference period and the date of first release of data, measuring the timeliness of distributive trade statistics;

(b) *Supportive indicators* that fulfil the criteria in para. 9.11. in the sense that they are considered important as indirect measures of the data quality. Such an indicator, for example, is the average size of revisions between provisional and final estimates of particular dataset which measures the accuracy of distributive trade statistics;

(c) *Indicators for further analysis* which are subject to further examination and discussion of statistical offices. After a careful analysis of statistical office capabilities and available resources, for example, some countries may decide to conduct a user satisfaction survey and calculate a user satisfaction index for measuring the relevance of distributive trade statistics.

8.13. It is recommended that careful attention is paid by the countries to maintain a correct balance between different dimensions of quality and use of a minimum number of indicators. The objective of quality measurement is to have a limited set of indicators that can be used to measure and follow over time the quality of the distributive trade data produced by the statistical office and that the users are provided with a useful summary of overall quality, while not overburdening respondents with demands for unrealistic amounts of quality metadata.

8.14. *Minimum set of quality measures/indicators*. The table below provides a limited set of key indicators[4] which countries are encouraged to use on a regular basis for

[4] For more quality indicators see European Statistics Code of Practice at http://epp.eurostat.ec.europa.eu/portal/page?_pageid=2273,1,2273_47140765&_dad=portal&_schema=PORTAL and IMF; IMF DQAF site at http://dsbb.imf.org/Applications/web/dqrs/dqrsdqaf/; UK Office for National Statistics Guidelines for Measuring Statistical Quality at http://www.statistics.gov.uk/StatBase/Product.asp?vlnk=13578

measuring quality of distributive trade statistics. They are easy to be implemented and give users a clear and up to date overview of the overall quality of distributive trade statistics.

Quality dimension	Quality measures/indicators
Relevance	R1. Identification of gaps between key user interests and compiled distributive trade statistics in terms of concepts, coverage and detail R2. Conducted users' satisfaction surveys
Accuracy	A1. Sampling errors - Coefficient of variation A2. Non-sampling errors - Unit response rate - Item response rate A3. Quantity response rate (% of total sales reported) A4. Number and average size of revisions of distributive trade data
Timeliness	T1. Time lag between the end of the reference period and the date of the first release (or the release of final results) of distributive trade data
Methodological soundness	MS1. Number and rates of differences in concepts and measurement procedures used in the collection/compilation of distributive trade statistics from the relevant international statistical standards
Coherence	CO1. Comparison and joint use of related distributive trade data from different sources
Accessibility	AC1. Number and types of means used for dissemination of distributive trade statistics AC2. Distributive trade statistics datasets made available by mode of dissemination as a percentage of total DTS datasets produced

C. Metadata on distributive trade statistics

8.15. *Content of statistical data*. Generally, statistical data consists of the following:

(a) *Microdata* - data on the characteristics of units of a population, such as establishments, collected by a census or a survey;

(b) *Macrodata* - data derived from micro data by grouping or aggregating them, such as total number of establishments or total value added;

(c) *Metadata* - data which describe the micro data, macro data or other metadata.

8.16. *Metadata*. The term metadata defines all information used to describe other data. A very short definition of metadata then is "data about data". Metadata descriptions go beyond the pure form and contents of data. They are used to describe administrative facts about data (who creates them, and when), how data were collected and processed before they were disseminated or stored in a database. In addition, metadata facilitate efficient searching and locating of data.

8.17. *Statistical metadata*. Statistical metadata describe or document statistical data, i.e. microdata, macrodata or other metadata. They facilitate sharing, querying, and understanding of statistical data over the lifetime of the data. They also refer to any methodological descriptions on how data are collected and manipulated. For distributive trade statistics data items for example, metadata include the name of the data item, the unit from which the information is collected, data sources, information about classifications used and series breaks, definitions and methodologies used in their compilation. Metadata are essential for the interpretation of statistical data. Without appropriate metadata, it would not be possible to fully understand statistical data.

8.18. *Metadata and quality.* There is a bidirectional relationship between metadata and quality. On the one hand, metadata describe the quality of statistics. On the other hand, metadata are themselves a quality component, which improves the availability and accessibility of statistical data.

8.19. *Users and uses of metadata.* There are many types of user and uses for any given set of data. The wide range of possible users and uses means that a broad spectrum of metadata requirements has to be addressed. In particular the statistical offices as data suppliers must make sufficient metadata available to enable the least and the most sophisticated users to assess data and their quality readily. It is recommended that segmentation of users into groups and a layered approach to metadata presentation be accepted by countries, in which each successive layer provides more detail. As a minimum segmentation, the following two levels of metadata are recommended:

(a) *Structural metadata* presented as an integral part of the data tables;

(b) *Reference metadata* providing details on the content and quality of data that may accompany the tables or be presented separately via the Internet or in occasional publications.

8.20. *Use of metadata to promote international comparability of data*. Metadata provide a mechanism for comparing national practices in the compilation of statistics. This may help and encourage countries to implement international standards and to adopt best practices in the compilation of particular area of statistics. Better harmonization of approaches adopted by different countries will improve general quality and coverage of key statistical indicators.

8.21. *Purposes of distributive trade statistics metadata*. The most fundamental purpose of metadata is to help users of distributive trade statistics to interpret, understand, and analyze the data, even if they have not themselves participated in the process of production of these data. In other words, distributive trade statistics metadata should help users to transform statistical data into information. Distributive trade statistics metadata help also producers of statistics. The new knowledge gained from interpreting the data may also lead to both production (lower the costs and improving the data quality) and dissemination (dissemination of comprehensive, timely, accessible, and reliable data) enhancements.

8.22. *Components of metadata*. In view of disseminating comprehensive distributive trade statistics their corresponding metadata should include the following six main components – (i) data coverage, periodicity, and timeliness; (ii) access by the public; (iii) integrity of disseminated data; (iv) data quality; (v) summary methodology; and (vi) dissemination formats. Each of these components is characterized with a few monitorable elements that can be observed by the users of statistics.

8.23. Countries are encouraged to accord development of metadata a high priority and to consider their dissemination an integral part of dissemination of distributive trade statistics. Moreover, it is recommended that in consideration of the integrated approach to compilation of economic statistics development of a coherent system and a structured approach to metadata across all areas of economic statistics be adopted, focusing on improving their quantity and coverage.

8.24. Various international organizations such as the IMF, Eurostat and the OECD have developed metadata standards and collected metadata for different areas of statistics. Further guidance on metadata for the purpose of distributive trade statistics will be elaborated and presented in the future *Distributive Trade Statistics: Compilers Manual*. Statistical Data and Metadata Exchange[5] (SDMX) technical standards and content-oriented guidelines provide common formats and nomenclatures for exchange and sharing of statistical data and metadata using modern technology. The dissemination of national data and metadata using web technology and SDMX standards is recommended as a way to reduce the international reporting burden.

[5] For additional information on SDMX see: http://www.sdmx.org/