

Implementation of Quality Assurance Frameworks for International Organisations Compiling Statistics

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The CCSA is asked to

- *take note of the draft guidelines, and*
- *to give its opinion on the quality issues addressed and the recommendations provided for implementing quality assurance framework activities*

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ANNEX

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1 Introduction

In recent years, much work has been going on in the field of quality management. Various quality management models and frameworks (like the EFQM model, ISO 9000, the DQAF of IMF or the European Statistics Code of Practice) have been advocated for the use in organisations producing and disseminating statistics. In considering data quality, statistical authorities have worked extensively on more operational definitions of quality in particular for assessing the statistical output quality and today most organisations do agree that quality is about the ability of a product or service to satisfy stated or implied needs. It has also become obvious that good process quality is a precondition for high output quality and there has been great attention during recent years for identifying, describing and measuring the quality of the statistical processes. It is also widely acknowledged that the institutional set-up in which a statistical authority operates can have a significant impact on the data quality.

Much of the work on quality undertaken by the international and supranational organisations has centred on the development of quality frameworks and processes for measuring and improving the quality of data compiled and disseminated by statistical authorities in (member) countries. However, it is only recently that international organisations started to apply to themselves the quality approaches they recommend to national statistical authorities. The current situation, where most international organisations do not have formalised quality frameworks in place and the fact that the existing frameworks are different (albeit overlapping) has been recognised by the Committee for the Coordination of Statistical Activities (CCSA).

In 2005, the CCSA endorsed a set of principles for enhanced functioning of the international statistical activities [CCSA, 2005a], which can be seen as the general super-structure supporting improvement of quality for global (interdependent) statistical systems and thus enhancing the credibility of the statistics but it needs to be put into concrete at the level of the individual international organisations and their specific statistical processes and the corresponding statistical outputs.

In order to promote the use and convergence of quality frameworks for international organisations, the CCSA supported in 2005 a Eurostat coordinated project on the use and convergence of international quality assurance frameworks [CCSA, 2005b] with the aim of bringing different quality initiatives under a common framework in order to ensure that the right

quality assurance procedures (methods and tools) are put in place and that the current and future quality activities of international organisations are well integrated.

A quality assurance framework for international organisations would contribute to the effective management of quality of international statistical and international organisations compliance with the CCSA Principles, thus, enhancing the credibility of international statistics.

This document is one of the project deliverables and the purpose is to facilitate the implementation of quality assurance frameworks in international organisations. It presents the scope and uses of quality assurance frameworks; the impact on data quality; costs and benefits; relationships between frameworks; implementation experiences; monitoring and evaluation; and how to work with quality tools in order to facilitate a systematic implementation of data quality assessment in international organisations. Furthermore, it promotes the convergence of quality assurance frameworks by providing recommendations at the end of each chapter. These recommendations are derived from common international statistical standards and good practices.

When reading, it should be kept in mind that one fit all solution is not possible. Implementation of any quality assurance activity has to be carefully tailored to the needs of each international organisation taking into account aspects such as the institutional environment, the quality management system in place, the size of the statistical activities, and the resources available. In particular, taking into account that statistics production often belongs to an arm (department, unit etc.) of an international organisation.

The guidelines build heavily on recent quality work carried out by other national and international organisations. All sources used are indicated but in some cases parts of reference material have been extracted or only slightly adapted since the information were considered to be of direct relevance for these guidelines.

2 Background and context

Over the last few years, many international organisations faces challenges – in common with most national statistical authorities - that have emerged due to the development of new Information and Communications Technologies (ICT) for statistics, the evolution of the global statistical systems, budget pressures and the need to improve efficiency of the statistical activities in order to be able to devote more resources to new statistical developments and to reduce reporting burden.

At the same time, the role of statistics has also grown in importance (like monitoring of policies, economic competition, social welfare ...) and this has reinforced the needs for ensuring principles like professional independence, impartiality and objectivity, and statistical confidentiality (e.g. institutional settings) are respected by the organisations producing the statistics.

Against this background, quality considerations play a crucial role. In fact, adherence to high quality standards is considered the key determinant in maintaining the public's confidence in statistics.

In this document, quality is interpreted in a broad sense, namely as encompassing all aspects of how well statistical processes and statistical output fulfil key stakeholders' expectations. High quality is, therefore, associated not only with meeting both internal and external users' expectations regarding the availability and information content of the disseminated data, but also addressing respondents' and compilers' concerns regarding the reporting burden, respecting respondents rights regarding the strict confidentiality of the individual information provided, and promoting the skills and ethical standards of statisticians.

In order to satisfy all stakeholders' needs, a strong emphasis has to be put on key aspects of statistical quality, in particular impartiality and objectivity, sound methodology, appropriate and cost-effective statistical procedures, statistical confidentiality, the avoidance of an excessive burden on respondents, relevance, completeness, accuracy, reliability, consistency, timeliness, and accessibility. All of these quality aspects are considered complementary and, in general, of equal importance.

A specific characteristic of the international statistical system is that the institutional set-up of each international organisation can be quite different (independence, accountability, responsibilities and regulatory power concerning data collection, etc.) and this can have a significant impact on the quality of the statistics produced.

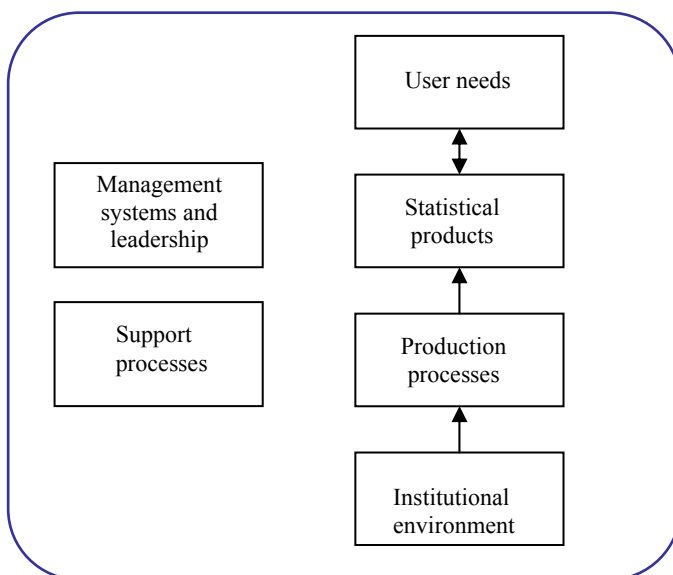
Another specific characteristic of the international organisations is the fact that they often compile statistics using data supplied by national statistical authorities or by other international organisations (it should be noted that data sharing among international organisations is becoming more and more common by the development of the technical standards needed). This implies that quality depends both on the inputs received from national compilers and on the international organisations internal processes for collection, processing, analyses and dissemination of data and metadata. The quality assurance procedures should therefore be organised accordingly.

3 The context of Total Quality Management (TQM)

A Total Quality Management (TQM) model, in general, defines areas of activity and criteria which have to be taken into consideration in quality management. The most important point of reference is the use made of the final output (user needs). Output characteristics and the design of the production processes have to be streamlined according to the requirements in terms of quality, time and cost.

As encompassing model, TQM also has a systematic look at the factors which determine output and processes more indirectly: leadership (including policy and also cultural aspects), management systems (e. g. corporate planning) and support processes (partnerships, financial management, human resource management etc.). Whereas all these elements are extensively covered in the focus of total quality management models, institutional aspects (like the political and legal frameworks) are not considered as part of the model and are normally regarded as external constraints, given that they are not under direct control of the organisation. They are, however, very important in the context of official statistics as they ensure the fundamental principles such as professional independence, legal mandate for data collection, data protection, impartiality, etc.

Figure 1. Scope of TQM / systematic quality work



TQM models concern the implementation of quality management on a meta-level. For example, the EFQM model focuses very much on the management systems within an organisation but gives only little concrete guidelines on how to improve a specific process or product. Similarly, ISO 9001 describes quality management requirements in a quite abstract way which fits in many different fields of economic activity. Accordingly, in the context of official statistics a further specification of these models is needed. Quality improvement at the organisational level takes into account the whole organisation and is reflected in so called institutional frameworks, while quality assurance frameworks provide guidelines for improvements on the product and process level.

With respect to quality work in official statistics TQM models introduce the idea of systematic, holistic approaches to assess processes. The strategic core of all major TQM models is continuous improvement of the organisation as a whole including management systems and support processes.

4 Institutional quality frameworks

Partly overlapping with TQM models, a number of institutional frameworks have been developed in recent years. The major objective of these institutional frameworks is to guarantee a certain number of minimum requirements, mostly in the international context.

These minimum requirements in first instance concern basic institutional features, like the professional independence, the legal mandate for data collection or the measures taken to guarantee statistical confidentiality. Besides such institutional aspects, often further aspects concerning statistical products and statistical processes are dealt with in some detail. Examples of such institutional frameworks are the Data Quality Assessment Framework (DQAF) of the IMF [IMF, 2003], the UN Fundamental Principles [UN Statistical Commission, 1994], the Principles Governing International Statistical Activities, and the European Statistics Code of Practice [European Commission, 2005].

Although the institutional frameworks focus on minimum standards regarding institutional aspects and (partly) regarding statistical processes and products, inspiration via TQM is also

obvious. Nevertheless, institutional frameworks do not cover the full range of TQM models. In contrast, they deal with the institutional aspects quite extensively (e. g. the European Statistics Code of Practice is very much influenced by the original idea of dealing with institutional aspects) and in focussing on product and process quality from a less management oriented, more institutional oriented point of view. On the other hand, institutional frameworks differ from the product and process level in covering various statistics and in focussing on the quality of statistical systems as a whole; less on individual statistics, which the product and process level do.

Figures 2a and 2b illustrate the scope of a general TQM model and the relationships with institutional frameworks for the production of official statistics.

Figure 2a. Scope and elements of general TQM models and the Principles Governing International Statistical Activities.

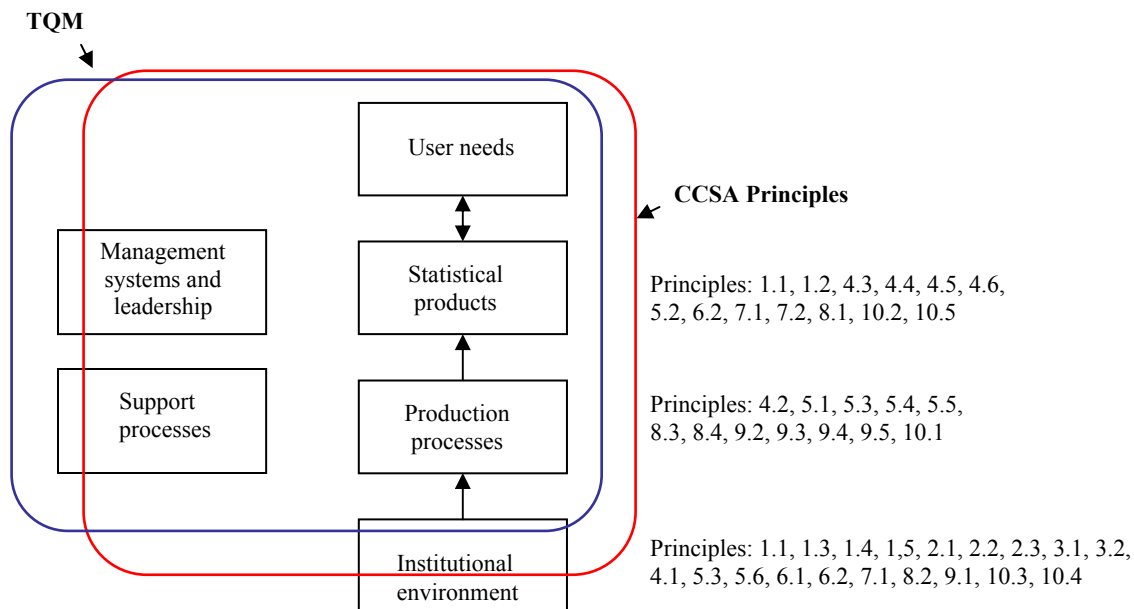
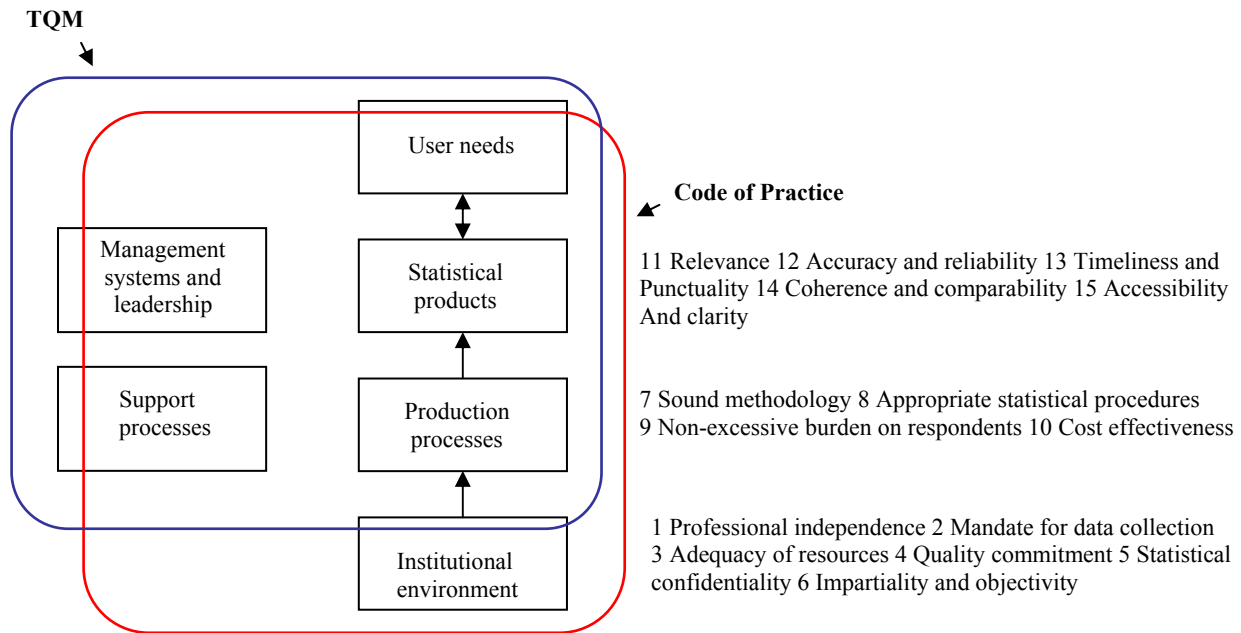


Figure 2b. Scope and elements of general TQM models and the Code of Practice



Source: Eurostat (2007)

Generally, the principles in institutional frameworks form the general superstructure to all other measures which are later described at the product and process level. They aim at supporting improvement of quality in the organisations as well as enhancing the credibility of the outputs via defining and assessing performance or benchmark indicators (e.g. "good practices"). Special emphasis lies often on the assessment of statistical systems and their positive development for international (co-operative) purposes.

The principles integrate a considerable number of indicators of statistical products and processes and, thus, cover the aspects of product and process quality nearly completely but in a fairly general and synthesised way aiming at providing a general picture of the respective organisation or statistical system. However, it should be possible to assign nearly all aspects of process and product quality to one or more principles in the institutional framework, although they are not always mentioned explicitly.

Institutional frameworks, like the Principles Governing International Statistical Activities and the European Statistics Code of Practice, can be seen as general superstructures forming the necessary basis for all other measures an international organisation need for improving quality at statistical process and product level.

5 Quality assurance frameworks

A quality assurance framework builds upon the mentioned TQM approach by providing more detailed guidelines for improvements at output and process levels which are the cornerstones for ensuring the quality of statistical products (or key statistical outputs). Its objective is to establish a system of coordinated methods and tools guaranteeing the adherence to minimum requirements concerning, mainly, the statistical processes and outputs including some kind of assessment. The main focus is at the level of *individual statistical domains* rather than the quality of the statistical system as a whole.

Consequently, quality assurance comprises aspects like:

- Documentation
- Standardisation of processes and statistical method
- Quality measurement
- Strategic planning and control
- Improvement actions

Effective methods and procedures for the assessment of all these aspects are key factors of the quality assurance framework. Furthermore, the tools and methods for assessment have to be fully integrated. The quality assurance framework builds heavily on the results from statistical data quality measurement which should provide input to strategic planning and improvement actions.

The data quality assessment methods, based on the results of the quality measurement and documentation of processes and statistical outputs, provide information that enables to systematically analyse data quality in each individual statistical domain. The results of data quality assessment are the main input to improvement actions.

The data quality assessment needs, as a frame of reference, some definition of minimum requirements, guidelines or recommendations. Therefore, a standardisation of production processes largely facilitates effective data quality assessment.

Quality assurance should not be confused with quality control, which is limited to controlling whether the products meet the quality requirements. Quality assurance, in contrast means regular evaluations of the production performance. A set of concrete measures (e.g. periodic reviews, self assessments, quality documentation etc.) have to be defined and decided how to achieve them.

Quality assurance frameworks (or frameworks for statistics production) have the objective to establish, in a specific statistical organisation, a system of coordinated methods and tools guaranteeing the adherence to minimum requirements concerning the statistical processes and products. Similarly to institutional frameworks, this includes some kind of assessment.

Consequently, quality assurance comprises all measures that make sure that

- Product quality requirements are being explicitly documented
- Processes are defined and made known to all staff
- The correct implementation of the processes is monitored on a regular basis
- Product and process quality are continuously monitored and documented
- Users are being informed on the quality of the products and possible deficits
- A procedure is implemented that guarantees that the necessary improvement measures are being planned, implemented and evaluated.

It is worth noting that in the literature terms like model or system are sometimes used synonymously to the term quality framework or quality assurance frameworks. The use of several terms in parallel might already indicate that “quality assurance framework” is difficult to define and indeed includes many (compatible) components, which might not always be restricted clearly to the product and process level but tackle the organisational level as well,

e. g. strategies and systems for measuring and reporting product quality, corporate planning, identification of current best methods, developing user-producer dialogue, standardised processes, review approaches, training and staff-perception studies.

These other initiatives for improving the overall management system of an organisation complement the implementation of the quality assurance framework and are often related to the development of process-, project- and risk management tools as well as internal control standards. The tools are designed to follow a generic management process of an administrative organisation (like control environment; performance and risk management; information and communication; control activities; and audit and evaluation).

In particular, the introduction a formal process management framework contributes to document all statistical processes in a consistent manner and thus forms the point of reference for assessing the overall efficiency of statistical processes and to implement risk management and change management procedures. A major benefit is the opportunity to manage and improve the efficiency of processes and the quality of the products by identifying synergies, dependencies, gaps and discrepancies within the regular production activities.

6 Data quality dimensions

In the context of this document, the notion of data quality refers to three aspects:

- (1) The perception of the statistical product by the user.
- (2) The characteristics of the statistical product (or key statistical outputs)
- (3) The characteristics of the statistical production process.

The three aspects are closely interrelated. The product quality is achieved through the production process. Different process designs will give priority to different product quality components. A process will never maximise all product quality components at a time (e. g. the trade-off between accuracy and timeliness). The way the product (and the process) is perceived by the user will often deviate from the way it is perceived by the producer. For example, the user might not always have a full overview on the entire set of quality components. He or she might also give priority to other quality components (e. g. the famous “timeliness instead of accuracy”), or have difficulties to assess the certain quality components without expert support (like accuracy). For this reason it is vital that data quality assessment also covers the question how the users actually perceive the quality of a statistical product.

Data quality assessment has to take care of all three quality aspects. Focussing only on the product quality (or the process quality or the user perception respectively) will not be a sufficient solution. However, according to the specific context, priority is often given to one of the aspects, mainly the product quality.

6.1 Product/ output quality components

Statistical organisations have worked extensively on more operational definitions of quality and in particular for assessing the statistical output quality. Today, there is a quite good convergence of the data quality concepts and the main quality components (dimensions, aspects, elements) among the international statistical institutes that have explicit quality definitions. They are all essentially along the same lines, including (generically): relevance, accuracy, timeliness, punctuality, accessibility, clarity/interpretability, coherence/ consistency, and comparability. However, the existing situation could be further improved by promoting the convergence towards one set of main quality components and the use of common definitions of these components. Some organisations (like IMF) also include aspects such as pre-requisites of quality, assurance of integrity and credibility. These aspects are most relevant at the level of the organisation, along with considerations of legal and institutional environments, resources and cost-efficiency, and could therefore be treated as secondary components when considering quality at the level of individual statistical outputs. It should also be noted that the component "methodological soundness" is singled out in some of the existing quality concepts. It covers important aspects related to international accepted standards, guidelines, or good practices for the statistics production and forms an important part of quality assurance. When it comes to assessing the output quality, these aspects can be covered by (mainly) relevance, accuracy and coherence.

The main product or output quality components (dimensions, aspects, elements) for the international statistical organisations are along the lines, including (generically): relevance, accuracy, timeliness, punctuality, accessibility, clarity/interpretability, coherence/ consistency, and comparability.

For a common terminology, the Metadata Common Vocabulary (MCV) is an SDMX (Statistical Data and Metadata eXchange¹) repository which contains descriptions and related definitions of all these quality components. Each international organisation can map their own quality concepts against the generic set of quality aspects outlined above and use terminology, descriptions and definitions of the quality components from the MCV.

¹ <http://www.sdmx.org/>

6.2 User perception of data quality

The product quality components could also be used as a framework for the assessment of the user perception of a statistical product. It should be noted that the quality components are the same, but users might perceive product quality differently than the experts. Furthermore, some of the quality components are difficult to assess by the user. For example, an assessment of accuracy of a given statistics requires at least some basic knowledge of statistical methodology. For the same reason, it will even not be easy for non-expert users to clearly define their quality requirements. Other quality components, like accessibility or timeliness are obvious and users are in a better position to formulate clear demands.

Assessing the quality of data from users' perspective is in line with the view that quality is to be decided by the user and in relation to the stated and implied needs of the user. To collect information on the expectations/needs and satisfaction of the different users is a basis for prioritising improvement actions.

6.3 Process Quality

Process quality is less straightforward in its definition, and there are *no standard definition(s) in place as for product quality*. However, several of the quality frameworks are in general covering also the statistical processes, such as: sound methodology, appropriate statistical procedures, non-excessive burden on respondents and cost effectiveness. Key process variables are usually referred to as those variables with the largest effect on product characteristics such as the product quality components mentioned.

They will vary by product quality component and by type of process. Typical process variables are resources and time used, response rates and burden and error rates (in editing). Processes can also be characterised by stability and capability, concepts introduced by Morganstein and Marker (1997).

A precondition for measuring the quality of statistical processes is that they are documented in a consistent and up to date manner.

The introduction of a formal process management framework contributes to document all statistical processes in a consistent manner and thus forms the point of reference for assessing the overall efficiency of statistical processes.

7 Quality and metadata

For users of international statistics, metadata explaining the quality of (national) data and to the extent statistics from different sources are comparable are crucial. Therefore, a considerable proportion of the work of international organisations to produce and disseminate statistics is to ensure that it is accompanied by appropriate metadata. Metadata that is, most of the time, provided by national statistical organisations, requires the use of standard formats and concepts for automatic reporting and re-usability/ exchange of metadata between national and international organisations. This should lead to improved quality reporting and minimised reporting burden. It should also lead to more harmonised and hopefully better documentation.

In this document, the focus is on the metadata describing the contents and the quality of the statistical data from the user perspective. The chapter builds to a large extent on the writings in Sundgren et. al. (2007) and Eurostat (2006).

7.1 Collection and sharing of metadata

Much of the recent work on more efficient exchange and sharing of data and metadata has been undertaken within the SDMX project which aims at efficient exchange and sharing of data and metadata. Prior to the end of 2005, the focus of the SDMX work was on the development of technical standards which are documented in SDMX 2.0 and now finalised and publicly available.

In parallel with the technically oriented work, a set of preliminary SDMX Content-oriented guidelines were elaborated and released for public comment in March 2006. These draft guidelines set out preliminary recommendations for classifications of metadata to be used for international exchange of reference metadata using the SDMX technical standards.

The SDMX project is also addressing the role of cross-domain concepts as an intermediary between the concept schemes of different organisations exchanging and sharing data.

The aim is thus to present a set of concepts that is suited for communication between many national and international organisations. Making this communication as easy as possible and

minimizing the translation or conversion costs would also provide an important service to users of the data, who could then access metadata, across data sources, based on the same modelling structures and common statistical terms.

A preliminary list of Cross domains concepts has been defined in the SDMX contents oriented guidelines that were released for public comments in March 2006. The SDMX concepts are intended to become a common language that will allow important features of national data structures to be translated into international ones, and vice-versa, using one common intermediary “language”.

Another dimension of the quality of statistics is “accessibility”, in the sense that data should be easily accessible and easily understood by users. The role of harmonisation of metadata also then becomes crucial: the more the metadata concepts are common across the dissemination agencies, the easier and less costly it becomes for users to access them across data sources.

The data and metadata of international organisations are usually collected from national statistical institutes. Therefore, the aim is to ensure that metadata, as well as data, can be copied directly from the systems of national statistical institutes. Additional metadata and “derived metadata” (based on the national more detailed metadata) may also be produced by the staff of the international organisations.

For the purpose of this chapter, the current OECD metadata system is taken as an example. The system is based on a set of corporate principles laid down in *Management of Statistical Metadata at the OECD*². The following principles are the most important ones.

Consistency: Statistical metadata must be consistent. This means that:

- the same variable name, definition, and other description should be connected to the same statistics, no matter where it is and who is the “owner”;
- the same variable name should not be used for statistics that are not identical;
- terms and concepts should be consistent throughout;

² <http://www.oecd.org/dataoecd/26/33/33869551.pdf>

- all OECD metadata, particularly reference metadata, should be made readily and freely available to external users.

Redundancy: Metadata on one element (a statistical collection or dataflow, a concept) should only exist as one instance, no matter how many times the same element is reused in different contexts. Ownership to the metadata should be clearly defined.

Common metadata items: A set of 42 metadata items are defined. All metadata from different subject-matter areas must be grouped under these headings. These are similar to the SDMX Cross-domain concepts and have been developed concurrently with those. The ambition is to have the closest possible consistency between the two sets. The present list of metadata items is shown in Annex 5.

Attachment levels: Metadata can be attached at any level of detail of the statistical data: at the global level (pertaining to all datasets), at the dataset level, at dimension level within a dataset, at dimension member level, time series, individual observations. To ease understanding and avoid repetition of data, it is recommended to always attach metadata at the highest possible (or reasonable) level; exceptions will then have to be stored for those lower levels where they apply.

In the context of this work needed, it is obvious that the use of the SDMX model and its advantages are optimised when the administration of metadata and their structural composition is well co-ordinated within an institution (across data reception, production and dissemination; and across subject matter areas) and also across institutions. This requires the establishment of a strong “structural metadata co-ordination function” within each institution (national statistical authorities, international organisations) which would also serve the communication and co-ordination across institutions

7.2 Dissemination of metadata on quality

The use of *a common format for disseminating explanatory texts about published statistics* presents several advantages. A common dissemination template simplifies the production and maintenance of metadata files, by providing a clear target; metadata for national and international series can be better integrated; and users are able to read and compare metadata for different domains and from different sources.

Since the “Special Data Dissemination Standard” (SDDS)³ – originally developed by the IMF for a number of macro-economic and financial domains - is well identified and already used by many statistical institutes for delivering metadata to the IMF, it is logical to promote the use of this format. But the original SDDS format can be a bit rigid for international organisations purposes. The main reason for this is that IMF presents information for each Member State dataset without being involved in any further processing. Some other international organisations, like Eurostat, on the other hand, processes and disseminates data and quality information for the entire EU and for this reason, the user expects to be informed not for each Member State data quality assessment but for an overall assessment from the EU perspective.

The SDDS- template hosts a variety of information items, common to most metadata formats, without providing too much information. The format consists of a “Base Page” and a “Summary Methodology”. The former covers the most basic and broad metadata - providing a short description of the domain, in terms of its coverage, periodicity, timeliness, legal basis or agreement and other general items - whereas the summary methodology has a more technical and statistical character. In the Eurostat adapted version of the SDDS, specific sub-elements (e.g. statistical units, reference period, adjustments and compilation of EU aggregates) were added to the original chapters in order to provide a more detailed statistical structure within the general template.

The “Special Data Dissemination Standard” (SDDS) – originally developed by the IMF provides a well defined format for disseminating metadata about country statistics but it might need to be adapted to take into account aspects related to further processing of country data for the production of international aggregates.

7.3 Assessment and monitoring of metadata

A number of guiding principles can be formulated for systematic monitoring of the quality of the metadata disseminated:

- A first guiding principle is that no data should be disseminated without a minimum coverage of metadata, in a standard format targeted at generalist readers.

³ <http://dsbb.imf.org/Applications/web/sddshome/>

- Another guiding principle is that a template for disseminating explanatory texts should be considered as a “derived product” based on a metadatabase, where metadata are stored according to a detailed typology of basic elements. From an internal repository, metadata could be extracted and assembled into more complex items, according to a predefined “style sheet”, to create, manipulate and display information.
- Metadata should be captured along the production cycle (survey design, legal acts, descriptions of periodicity, timeliness, etc.) rather than being created in the dissemination phase. A general metadata system should also take into account that some metadata elements are defined and exchanged within other processes,
- For each domain or sub-domain, one administrative unit (and contact person) should be identified, for internal use by the responsible team, as responsible for maintaining the information and for responding to users’ feedback.
- The quality check of produced and disseminated metadata is a fundamental part of the work, to be performed at regular intervals, normally every time the database is updated.

On metadata assessment in general terms, monitoring activities should always be performed regularly. Statistical metadata, just like data, are far from being static. Continuous updates, together with the frequent creation of new domains and metadata require regular quality checks. Quality checks can be “user-oriented” or “producer-oriented”. User-oriented analyses deal more with the accessibility of web pages (retrieval of information, navigation in the website, search facilities etc.), the relevance of the disseminated information for various user categories (like advanced, moderate users and general public) and consistency, completeness and clarity according to different user requirements and related legislations. Some of these aspects are also covered by producer-oriented analyses; however, producer-oriented quality checks aim at helping producers in using the prescribed standard by assessing the distinct files against the standard concepts.

7.4 How to integrate information on quality assessment

This chapter provides some guiding principles for improving, in particular, the metadata on quality disseminated on the web.

- Sufficient information on quality issues should always be available together with the data (set) under consideration.
- A well-organised and standardised template, such as the SDDS template, is essential for better encoding, with a clear terminology, including key quality indicators that can be easily derived and reflect user requirements.
- The quality information should follow users' queries, for example when selecting variables or time-series for particular themes of interest only the relevant quality information should follow.
- There should be search facilities on the websites for "quick" and "advanced" retrieval of quality information that serve all kinds of users and the requested information should be relevant to the exact specification.

The possibility of browsing metadata from different national and international providers can be facilitated through the identification of commonalities in the metadata structures and by developing reference metadata formats (provided the information is available in a common language). From the technical point of view, there is an advantage of the existing trend - supported by the standard-setting community - towards the provision of metadata in XML format (extensible mark-up language) as this allows users to query metadata across various sites for retrieving a customised reporting.

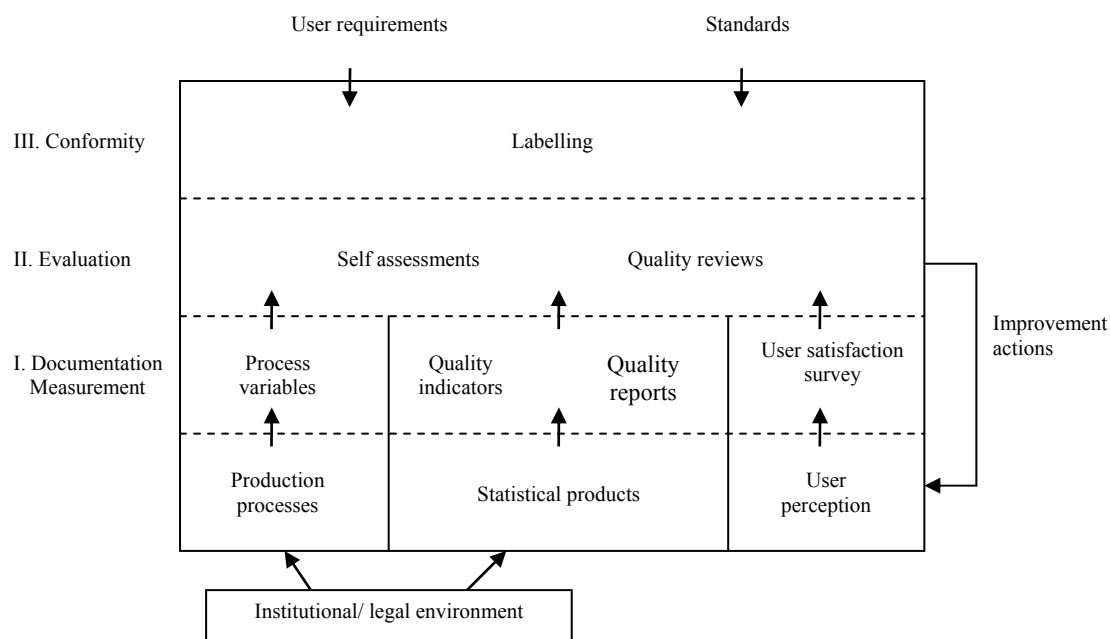
8 Methods and tools for the assessment of statistics production

The methods and tools presented below facilitate the assessments of the statistical outputs, the statistics compilation processes, as well as the user perception of the released statistics. A more detailed description of each tool is provided in annex 1. To a certain degree, the methods rely on a number of preconditions. On the one hand, the application of quality assessment methods always requires some basic information on the outputs and processes under consideration. For this reason, at least a basic systematic quality measurement regarding processes and outputs has to be in place. There also has to be a documentation system giving access to key characteristics of the outputs and processes. On the other hand, quality assessment methods require an (internal or external) standard as a reference against which the assessment can be carried out. Such reference

can be provided in the form of general guidelines, policies, minimum standards, process specific guidelines and product specific quality standards defined e.g. by legal requirements.

As figure 3 shows, the different quality assurance methods tend to be either closer to the documentation for the producer side or closer to the standards and user requirements for the user side. On the way from the documentation of production to standards and user requirements, information is being more and more condensed and hence more appropriate for the information of managers and users. Here, three layers of quality assessment methods are distinguished.

Figure 3. A structure for tools and methods for assessment of statistics production systems



N.B. Figure derived from draft Handbook on Data Quality Assessment Methods and Tools (DatQAM), version 31.01.2007.

a) Documentation and measurement

In the first layer, the complex information obtained from measurement and documentation has to be selected and structured in order to become meaningful for quality assessment. For this purpose, methods like key process variables (such as resources used, time used, error rates and response burden), quality indicators (like revision size, coefficient of variation, response rates), quality reports, and user satisfaction surveys are being used. The user satisfaction surveys are less based on information from documentation (maybe in the case of a complaint management system), but still measure directly the user perception of specific statistics.

b) Evaluation

Based on the information compiled in the first layer, the conformity of statistics is evaluated against (internal or external) standards. Evaluations can range from self-assessments to quality reviews of different intensity in their scope and external involvement. In a self assessment, the assessment is carried out by the domain manager (or the team) often assisted by the "quality team" of the organisation. On the other hand, the concept of quality reviews do introduce a neutral (and sometimes external) expert and cover both rolling reviews and peer reviews. In particular for rolling reviews which are more comprehensive exercises, several methods and tools are combined in order to have a better assessment of statistical products including its relevance for producers and users.

Self assessments and quality reviews might use specifically designed checklists (e.g. the Checklist for Quality Assessment of Statistics Compiled by International Organisations) in order to present the information needed in a more structured and accessible way. In general, they show a broader picture with less detail than process variables, quality indicators, quality reports and user satisfaction surveys. They also provide an overall picture of the adherence of a given statistics with the standards. At the same time, they still provide information on various quality dimensions or main processes.

c) Conformity

The methods of labelling further condense the information and ensure to users and the general public the compliance with a whole set of defined standards and requirements. Labelling – as the term indicates – consists of providing any kind of label to the statistics or processes that meet pre-defined quality requirements. It is a way of showing the users which statistics fulfil strict quality criteria and which ones have to be used with some caution. The label thus provides a type of highly condensed information regarding the statistics released. Furthermore it can help to enhance trust and credibility in official statistics.

9 How to apply quality assessment tools

Quality assessment should build on a general implementation strategy and be applied in a step-wise way. However, the implementation has also to be tailored further according to the institutional and the statistical activity. Such preconditions for quality assessment concern the standards of what has to be assessed, often expressed in legislations, and the size and importance

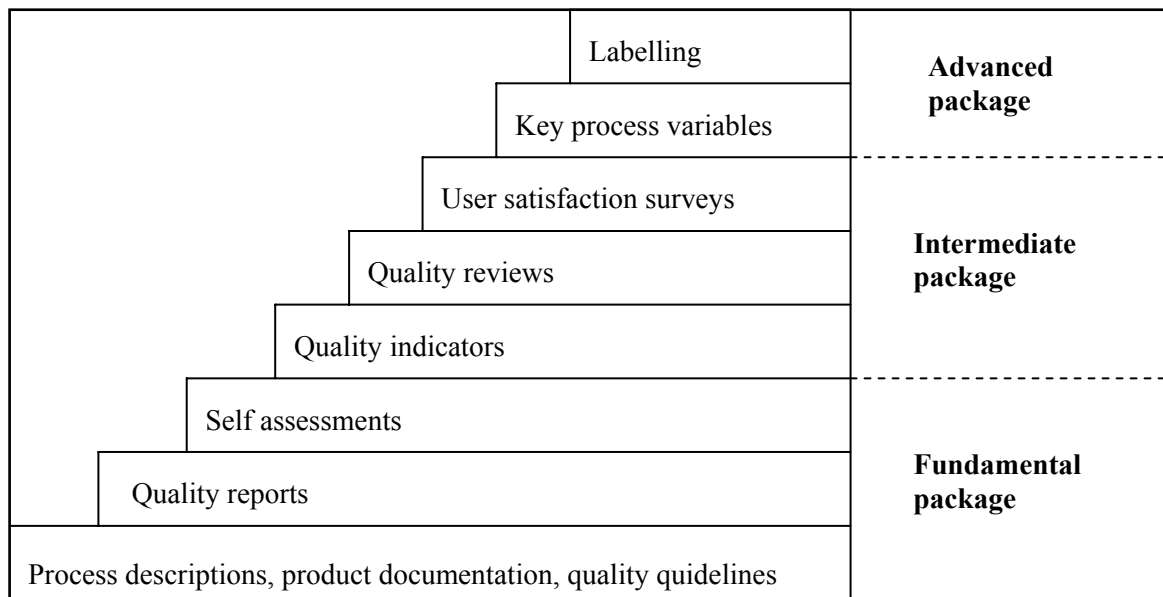
of the statistical activity. The assessment of a minor statistical activity might only require basic documentation and measurement, while a major activity (in terms of political importance) might require more comprehensive quality assessments guaranteeing the quality of statistics, including labelling.

The use of the assessment methods can be tailored according to the relative importance of a statistical activity taking into account:

- The office-wide quality management approach.
- Institutional preconditions (procedures and legislations).
- Assessment methods already in use.
- Relevance (size and importance) of the statistics including production periodicity and the existence of specific legal framework.

Figure 4 shows how the battery of assessment methods can be applied to statistical activities depending on how they fulfil the above criteria.

Figure 4. The quality assessment packages



N.B. Figure derived from draft Handbook on Data Quality Assessment Methods and Tools (DatQAM), version 31.01.2007.

The fundamental package is based on basic documentation of the production processes and the statistical outputs. The quality reports should follow the applied quality concept structure and should include quantitative indicators where possible. Despite quality assessments for the various quality components, quality reports are largely descriptive in character. The fundamental package

should in any case include elements of an evaluation. For this purpose, self assessments are the appropriate method since they are easy to implement and have a low burden for their completion. The fundamental package is thought to be applied to all statistics. For some statistical domains, with low periodicity and under gentlemen agreements, it might be enough to use these tools. For other statistical activities, the methods of the intermediate package are necessary in order to validate the assessment (based on the expert appraisal in the fundamental package) with the help of objective information (quality indicators) as well as an evaluation by (external or internal) experts in reviews and by users in user satisfaction surveys.

Any substantial quality improvement will necessitate changes in the production processes. Quality assessment should therefore also take into account the processes. Process quality is normally at least in part covered by self assessments and audits. Continuous process improvement in addition requires systematic measurement of the performance of the processes. Key process variables can be used for an assessment of process quality and they should be conceived together with the quality indicators. If a standard set of key process variables are to be used, at least a certain degree of process standardisation is necessary.

Labelling is no quality assessment in the strict sense, but a special way of communicating quality standards to the users. The implementation of labelling can only start if the necessary standards are in place. Consequently, the focus regarding labelling is on proving that the statistical institute meets external standards. In the case of labelling, the standard will normally be (co-)defined by the statistical institute. So far, no international organisation has implemented the process of labelling of their statistics.

10 Quality assessment tools – implementation aspects

One could argue that all quality assessment tools and methods (except, maybe, labelling) have to be applied. At the same time, it is of utmost important that implementation efforts build on the methods which are already in place and aim at stepwise standardisation within a systematic and regular approach.

There are also logical interrelations between the methods. For example, there is a strong link between quality reports, quality indicators and process variables on the one hand and self assessments and quality reviews on the other which can use common tools such as the Quality Assessment Checklist.

10.1. The assessment tools and methods

The following tools and methods are considered of strategic core to be embedded into a general quality assurance framework for international organisations:

a) Documentation and measurement

- Process descriptions (identification, documentation, and analyses of processes) of statistics production based on a formalised process management methodology. Process descriptions are a precondition for all other quality assurance activities.
- Producer-oriented quality reports (“Full Quality Report”) following a standardised structure and containing detailed information on all aspects of quality that are important for the producer of statistics. The content should be detailed enough to allow the producer of statistics to see the results of earlier production (e.g. to evaluate if the product quality meet the quality targets/ requirements) and to identify the points for further improvement. The Full Quality Report is quite burdensome to produce and could therefore be compiled every 3-5 years.
- User-oriented quality reports following a standardised template (and common concepts) summarising the main quality features of the statistical outputs. The users should be provided with appropriate textual information supporting the quality assessment. For special type of users the relevant parts of the “Full Quality Report” can be selected to compile a “Summary Quality Report”. The Summary Quality Report is static, web-based summary of quality information that can be compiled every 2-3 years and applied for all more frequent releases. “Basic Quality Information” consists of dynamic, release specific quality measures and the most important quality information.
- User satisfaction surveys to key users and the public. Given that user surveys can be of many different kinds and with different purposes the specific approach must, of course, be chosen with the intended purpose in mind (see annex 1.3).

b) Evaluation

- Self assessments for internal review of all statistical production processes by the use of the whole or parts of the Quality Assessment Checklist for international organisations for the identification of strengths and weaknesses and the list of improvement actions and the quality diagram.

- Quality reviews for key statistical outputs, taking into account aspects such as size of the statistical activity and the importance of the usage of the statistics, in the form of assessment assisted by an internal quality team or assessments incorporating external expertise.

c) Conformity

- A Process for labelling of key international statistics. The development of a common approach for labelling of key international statistics, aiming to inform users, in a clear and simple way, on key statistics complying with quality assurance framework requirements.

The strategic elements resulting from self-assessments and quality reviews should also be incorporated into the management plans of the international organisation and be used for enhancement of office wide improvement actions. By having an integrated and office-wide approach, quality improvement can be achieved in a systematic way including comparability between different statistics and of different times.

International organisations work on developing technical and content oriented standards, guidelines, or good practices for the statistics production processes are important for effective quality improvement and, thus, forms a cornerstone of any quality assurance framework.

10.2 Application of the assessment methods

Assessment methods for statistical processes and outputs have to be planned and tailored according to the relative importance of a statistical activity. This requires as a first step, the identification of the statistical processes and their characteristics and the mapping of the processes with the types of quality assessments to be used.

Since statistical processes are quite diverse they need to be characterised according to some basic criteria. The relevance of the output produced is a key element for assessing the relevance of the process. The productions of key outputs or contributions to official reports are important elements for deciding the relevance of the statistical processes.

However, this is not the only aspect to be taken into consideration. Human resources involved in the process, the periodicity of outputs, whether a legal basis exist or not, the type of data (surveys, administrative/accounting, or mixed data), the intervention of national statistical authorities in the

data collection and transmission to the international organisations, and the degree of internal control in the management of the process, need to be taken into account when planning quality assessments.

For processes considered to be assessed, the same type of quality assessment should be applied for all processes having the same characteristics. The following basic criteria are used by Eurostat to illustrate how to map groups of processes with type of quality assessment:

- For processes with low periodicity, no legal regulation and producing low visibility outputs, self-assessments (which are the bottom line of quality assessments) seems to be suitable. For these processes the availability of limited quality reports, previous to a self-assessment might be enough, given the investment needed for producing full quality reports.
- For processes involving important financial resources and high number of staff, with short-term or yearly periodicity, which are in the front line of user's demands of statistical outputs, quality reviews with essential external intervention (which is the most intensive quality assessment) should be reserved. Such quality reviews are quite resource intensive and should be limited.
- For other processes, quality assessments (with external interventions or not) should be chosen but allowing some flexibility in order to take into account the specificities of the process and the opinions/demands of the process owners.

As already mentioned, quality measurement regarding processes and outputs has to be in place before quality assessments are conducted, e.g. availability of quality reports. This implies in practice that processes without quality reports, in principle would need to be excluded from quality assessments until quality reports are available. An exception could be self-assessments (in the context of applying the fundamental package) where a basic data quality information may be sufficient.

It should be noted that OECD has extensive experience in applying procedures for reviewing the quality of both new and existing activities. The procedure is described in [OECD, 2004] and the reviews are carried out on a rotation basis over a number of years.

11 Data quality assessment recommendations

Data quality assessment should be implemented in a step-wise approach. The packages identified above suggest a general implementation strategy. However, the implementation has to be tailored according to the institutional and cultural context of the statistical authority.

Another aspect is, of course, the methods already implemented. This can also necessitate choosing a different sequence of the implementation of the methods.

The following general recommendations should be kept in mind in the adaptation to the requirements of a specific statistical authority.

- Top management commitment is vital. They should clearly commit to the implementation. The consequences of the decision to use certain methods have to be communicated clearly too top management. Systematic data quality assessment can never be achieved without full top management support.
- The most effective way of top management support is that managers demand results from the assessment and use these results for their decisions.
- The role of the middle management should not be underestimated. If the middle managers are not committed, a successful implementation is very difficult to achieve. Special incentives are therefore needed in order to reach middle managers.
- Data quality assessment is a long term project. The main problem is not to start systematic data quality assessment, but to keep the process going on. Regularly, new incentives are needed for sustained motivation. Quick success should be promoted internally as well as externally, and the staff should be made aware of the progress reached so far.
- Most methods should be implemented and fine-tuned in pilot projects. One option is to start with a few thematic areas only. The selection can be done in a way that makes the start easy and makes it probable that quick successes could be achieved which motivate both the quality team as the subject matter statisticians for further developments.
- Standardise the use of the methods (e.g. standard quality indicators, standard process variables which could be supplemented by additional information).
- From the beginning clear responsibilities and authorities should be established. There should be sufficient resources allocated for supporting the assessments.

12 Costs and benefits of quality assurance frameworks

The costs and benefits of having a quality assurance framework in place depend upon the role(s) of the organisational units. Designing a quality assurance framework brings benefits to the designers themselves. It usually brings people together from a range of disciplines, which is good for communications as well as for identifying and becoming informed about best practices. The existing quality frameworks should be a starting point and further adapted to the particular circumstances. The costs are staff costs. The staff with the sort of skills required to lead the design of a quality framework are usually in great demand for other design work too. As described in [Colledge, 2006] the benefits of completing a quality framework template include:

- increased awareness of quality concepts, components and best practices;
- completion of a systematic quality assessment;
- an indication of potential quality problems and improvement options and priorities;
- a possible means for comparisons of the level of quality over time;
- an indication of the need for additional resources and/or training

The ultimate target of any quality framework is for it to be built into the organisational structure so that the corresponding quality practices and monitoring procedures are an integral part of routine developmental and operational processes. In a well developed and run statistical organisation this may well be the case. Each unit within the organisation will be responsible for managing quality in its particular domain, and one unit likely have responsibility for promoting quality considerations generally, sometimes in direct contrast to performance and efficiency concerns, which will likely receive constant attention as a result of tight budgets.

In the case of a statistical authority that is not as well developed or in a state of crisis, the quality framework may be of more explicit importance. It can provide a mechanism for both (relatively major) reengineering and (relatively minor) quality improvements

Quality can never be considered in isolation from cost, or more generally, performance. Even if cost (or performance) is not a quality dimension, it is part and parcel of quality assessment.

Performance includes not only cost to the producer of collecting and disseminating statistical data but also the cost to the initial provider, usually referred to as respondent burden.

The preparation time and cost implementing specific quality activities depend on the circumstances, like the methods and tools already in place, the integration level in the production environment and the technical infrastructure supporting the production. In annex, a rough indication of time needed is provided for each quality tool.

A Quality Assurance framework should always acknowledge performance/ cost.
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13 Conclusions and outlook

These guidelines promote the use and convergence of quality assurance frameworks. The use of quality assurance frameworks meaning that each international organisation should have a comprehensive quality assurance framework in place. Making explicit in one document the quality principles applied and the quality assurance procedures followed would further increase transparency of the statistical procedures, as well as providing a benchmark within the organisation. At the same time, such a quality framework would need to be compatible with related general office-wide procedures and rules. The convergence of quality assurance frameworks is taken to mean bringing the frameworks into alignment as regards concepts and standardising their content. This would lead towards a smaller number of quality frameworks which would include benefits as:

- standardising terminology for the benefit of all concerned – producers and users;
- promoting current best practice;
- reducing reporting burden.

The ultimate goal being replacement of separate frameworks by a single one is hardly neither achievable nor recommendable. The limitations on the extent to which it can be achieved should be recognised. The institutional environments under which international organisations function are different. Statistical activities are, with a few exceptions, only a small part of the overall activities carried out by international organisations and in particular ICT solutions used by international organisations for collecting, analysing and disseminating statistics are frequently chosen in accordance with the requirements of other parts of their organisations.

However, striving for the best possible quality in terms of statistical processes and outputs is a continuous task for statistical organisations and the quality assurance activities described in this document can be used to ensure the credibility of the statistics compiled by applying *good*

practices along the entire statistical production chain, which forms the core of all statistical systems. The identification of best practices across different production areas in the organisation with regard to specific details of quality assurance procedures, in particular concerning the validation (checking) of data, may potentially yield further gains in terms of efficiency and effectiveness.

In all areas of work of an international organisation, and in the work on statistical quality in general, the value of developing common standards and sharing of good practices with other international and national statistical organisations can hardly be overestimated.

In this respect, the bilateral and multilateral co-operation among international organisations has improved over the last few years mainly following a bottom-up approach, especially among the larger organisations, but a more general “strategy” encompassing both ICT infrastructure and quality issues is necessary to orient international organisation activities and to benefit from the opportunities created by new institutional setups and technological changes, bearing in mind the final target of improving the quality of international statistics.

It is hoped that this document will contribute towards specific implementation strategies in the quality field – implementation strategies that have to be carefully tailored to each international organisations' specific need.

ANNEX 1

1. Data Quality Methods and Tools

This annex gives further information about the data quality methods and tools. Recommendations regarding implementation of respective tool are provided at the end of each section. The description is to a large extent built on [Eurostat, 2007b].

1.1 Quality Reports and Indicators

Quality reports are important for users and producers of statistics. Users of statistics need to have access to a range of relevant quality measures and indicators for understanding the strengths and limits of statistics and to know how to use them properly (user-oriented quality report). Producers need to have a picture on the product quality in order to see the results of the earlier production developments and to identify the points of further improvements (producer-oriented quality reports). For this end they need the most detailed quality reports and a number of indicators, involving the processes behind.

Quality Reports

Quality Reporting is the preparation and dissemination, on a regular or irregular basis, of reports conveying information about the quality of a statistical product or survey. A quality report provides information on the main quality characteristics of the product (e.g. set of statistical outputs) so the user would be able to assess product quality. In the optimal case quality reports are based on quality indicators.

The main potential target group of a quality report are the users of statistical products outside or inside the statistical institution. Moreover, quality reports on statistical products are important to the producers and management for purposes of monitoring. The quality requirements and statistical expertise of user groups are different and therefore a single quality report will not satisfy them all, however a standard structure is preferable. The standard structure makes it easier to find the use and user-specific relevant information, and facilitates comparability over time or among products.

In addition - although they are not quality components - it is advisable to add a general description of the sources and methods used, and cost and burden in order to support quality assessment.

In practice, several forms of quality reports need to be in place depending on the intended use. Here, three different forms are singled out:

- Summary Quality Report (user oriented)
- Basic Quality Information (user oriented)
- Full Quality Report (producer oriented)

The “Full Quality Report” can be considered as the broad framework. It should follow a standardised structure and contain detailed information on all aspects of quality that are important for the producer of statistics. The content should be detailed enough to allow the producer of statistics to see the results of earlier production (e.g. to evaluate if the product quality meet the quality targets/ requirements) and to identify the points for further improvement. The Full Quality Report is quite burdensome to produce and should be therefore be compiled, as a rule of thumb, every 3-5 years.

User-oriented quality reports should follow a standardised template and use common terminology for the quality aspects. The user-oriented quality reports should summarise the main quality features of the statistical product. The users should be provided with appropriate textual information supporting the quality assessment. For special type of users the relevant parts of the “Full Quality Report” can be selected to compile a “Summary Quality Report”. The Summary Quality Report is static, web-based summary of quality information that can be compiled, as a rule of thumb, every 2-3 years and applied as a reference to all more frequent releases. “Basic Quality Information” consists of dynamic, release specific quality measures and should contain the most important quality information. When deciding to produce the user-oriented quality reports, the involvement of a wide range of users is a precondition.

In lack of quality reports the description of the production process or process tables (i.e. quality reports on regional national accounts) can be used as a source of some quality information.

Some international statistical organisations have special types of user oriented quality reports summarising the main quality features according to a “grading” system. These types of reports can be useful for special types of data or for specific purposes.

Quality indicators

Quality indicators are specific and measurable elements of statistical practice that can be used to characterise the quality of statistics. The development of a quality indicator aims to change the measurability level from nominal to ordinal or interval scale and to find indicators more related to the phenomenon. The quality indicators measure the quality of statistical products or processes from several aspects. Some product quality indicators are derived from processes, therefore they are called process variables as well (see section 1.2 on process variables). Quality indicators make the description of the product by quality components more informative and improve transparency.

However, indicators always simplify reality. There is a danger of false interpretation of quality indicators if this is done without taking into account background information as well. When using quality indicators for informing the users on the quality of statistics, it is recommended to include qualitative statements, assisting in the interpretability of the quality information and to summarise the main effects on the usability of the statistics.

Some quality indicators should be produced for each statistical output in line with the frequency of production or publication (for example, standard errors would be calculated related to each new estimate). However, some quality indicators should be produced once for longer period, only to be re-calculated where there are major changes (for example, time lag between the end of reference period and the date of first results. The calculation frequency of the indicators depends on the purpose of quality indicators (for example monitoring the quality over time) or on frequency of survey process or publication.

Critical values can help to assess the quality via quality indicators. However, the critical value of an indicator can be different depending on the respective statistics. It can also be a precondition of the publication, for example in the U.S Census Bureau, suppression occurs when one or more of the following criteria are met: the Relative Standard Error is greater than 20 percent; the imputation rate is greater than 50 percent; etc.

There have been several trials to compile one composite indicator to summarise data quality features and to give one overall quality measure. A composite indicator should be based on a theoretical concept which allows individual indicators to be selected combined and weighted by reflecting the components of the quality. These proposals failed since the set, trade-offs and importance of indicators / components are product- and user- specific. Up to now it was not possible to find a general solution.

Quality indicators can be used:

- to allow the survey managers to monitor their production processes, to evaluate the quality over time and to compare the indicators with appropriate average values;
- to allow the users to analyse survey characteristics and compare the quality of different statistics;
- to provide the top management with qualitative and quantitative information for decision making purposes;
- to collect and disseminate documents on quality-related issues.

Recommendations on quality reports and indicators

- Preparation of quality reports need time and efforts, they are efficient only if they are used in a proper way: their level of detail, structure and form for the targeted users must be suitable (not too long for managers, easy to understand for public users...).
- The aim is not to overburden either the data producers or the users; therefore in the short term priority should be given to some domains, some quality components and certain indicators. The importance of a component should be weighted up by considering which users will directly or indirectly require information on it.
- Using the same quality report template with a limited set of standard indicators for different products will support the transparency and the users' understanding. Levels of detail are adapted to the needs of the target group and user specific indicators can be added. It is vital to improve and enhance the measurability of indicators on products and processes.
- The process of measuring quality should be the part of any statistical production process and should not be a separate activity carried out after the statistics are produced or when somebody needs it. This is not only for the cost and time efficiency, but for the purposes of quality improvement as well.
- It is not advisable to describe quality solely by a set of quantitative indicators, appropriate textual information should be also provided.
- When using indicators it should be kept in mind that these indicators are not identical with the phenomena. Indicators may be misleading or focus only on a part of the phenomena, they may overemphasise the given (measurable) aspect.

The preparation time and cost of indicators and quality reports depend on the circumstances: the documentation system in use, the integration level in the data processing, and the IT support of data processing. Developed documentation and meta system or integrated data processing with IT support can reduce the burden. The estimation of time and financial resources needed can be based on the experiences of the first steps of gradual implementation.

1.2 Measurement of Process Variables

"Key process variables are those factors that can vary with each repetition of the process and have the largest effect on critical product characteristics, i.e. those characteristics that best indicate the quality of the product" [Jones and Lewis, 2003].

Measurement of key process variables is the basis for process management and continuous quality improvement, but also provides input to quality indicators and quality reports.

Furthermore, a selection of key process variables will assume an important role in self-assessments and audits as well as in a labelling and certification. For example, the Quality Assessment Checklist includes measures of many variables linked to statistical production processes, from data collection to processing and analyses of statistics.

The method consists of using quantitative indicators in order to monitor and to assess processes over time, and detect sources of error to improve existing processes. It should

Therefore be used for established, i.e. repetitive processes that are important for data quality.

In this case, measurement series for process variables might exist. Often (repetitive) measurements do not exist. This is the case when new processes are developed.

In order to establish a basis for data quality assessments and future improvements it is important to start identifying and measuring key process variables. The method will be applied most effectively if processes are standardised in the statistical authority at least to some degree.

Statistical authorities have always measured some process variables. Examples are measurements of non-response of different types, interviewer performance, costs and use of time for different processes. However, what has often been lacking is a systematic approach to identifying and measuring such variables.

Furthermore, there are surprisingly few papers on measuring and analysing process variables in statistical authorities, despite the fact that there has been a focus on the study of processes as a basis for quality improvements during the last 10 years.

The main types used in practice are:

- Interviewer performance
- Resources used
- Time used
- Response rates
- Response burden
- Complaints
- Error rates (for example in interviewing, editing and coding, disclosure control and dissemination)

Each type usually consists of several variables which are broken down by different characteristics, such as type (of non-response or error), size (for example non-response in businesses) and user group (complaints).

A book of Biemer and Lyberg (2003) on survey statistics contains a series of examples of analysing process data linked to the data collection process.

Recommendations

- Promote measuring process variables, but start carefully (e.g. by focussing on a specific process)
- Be selective, i.e. choose variables that are really important (key process variables) when starting measuring
- Try not to ignore process variables which are difficult to measure, but critical for data quality
- Management should demand measurements and use these or indicators based on these for their planning and follow-up

Time and costs linked to measuring and analysing process variables may vary. In order to collect the "low hanging fruits" it is important to store what is already measured.

Measurements can be facilitated by convenient software packages that are also used for other purposes (for example planning and reporting systems, accounting systems, help-desk

systems etc.).

1.3 User Surveys

Assessing the quality of data from the users' perspective is in line with the view that quality is to be decided by the user and in relation to the stated and implied needs of the user. The existing frameworks all highlight user orientation and carrying out user surveys as a way of assessing how the users perceive the quality of what they receive.

The main objective of a user survey is normally to get information on the users' perception as a basis for improvement actions. Thus, they provide a valuable input to self-assessment and auditing activities which are covered in section 1.4.

Statistical authorities are concerned with a great number of different users, all having different expectations concerning the quality of products and services. In order to get information on the expectations and satisfaction of the different users, diverse types of user surveys can be carried out. These include:

- General ("traditional") user surveys, directed to diverse known users of products/services, as well as
- Image studies ("surveys of confidence") directed to unknown members of the general public and
- Target groups and product/service specific survey forms, respectively, like
 - interviews with key users (important stakeholders),
 - questionnaires added to printed publications,
 - web questionnaires for web-users,
 - special questionnaires for recipients of press releases, press conferences, expert meetings, training courses,
 - special questionnaires for users of the data shop/library, etc.

Given that user surveys can be of many different kinds with different purposes the approach must, of course, be chosen with the intended purpose in mind.

Since it seems to be limited experience in assessing data quality through user surveys, strong recommendations for implementation are difficult to provide. There are however some issues to highlight.

Recommendations

- Categorise the users so that they correspond to categories that are already used for other purposes. For example Ministries, Researchers, Private enterprises, Media and the General public.
- Try to identify individuals as respondents – those who really use statistics – rather than representatives of organisations/functions.
- If necessary, tailor the questions to the categories, taking into account that different categories normally can only reply to certain aspects of the quality concept.
 - Less experienced users might only be able to provide meaningful feedback on data quality aspects like timeliness and punctuality and accessibility and clarity.
 - More experienced users can be expected to also provide feedback on accuracy, comparability and coherence, while relevance seems too difficult to capture using traditional methods for user satisfaction surveys.
- Take extra care to formulate questions targeting assessment of data quality (in the broad perspective of the quality concept).
- Realise that perceptions are measured, which is influenced by many factors, not some absolute value.
- Test the questionnaire for suitability.
- Choose the survey method in relation to the target group:
- Communicate the results of the data analysis, both to respondents and internally in the organisation.
- Make sure that the results are used, e.g. actions taken that will improve “quality”.
- Don’t ask the users for a repeated assessment before you have taken actions based upon the previous results.
- Expect low response rates compared to the regular surveys of statistical institutes, but also consider every reply as unique and important.

1.4 Quality reviews (self assessments and audits)

This section describes powerful approaches that allow organisations to check and review their processes and products. Depending on the key references of this check and review activity, its

sponsor and its organisational aspects, they may be called self-assessment, audits, or even peer reviews. It can be undertaken by internal or external experts and the time-frame can vary from days to months, depending on the scope, however, the results are fairly identical – the identification of improvement opportunities in processes and products.

These approaches may be implemented in different steps. The easiest approach to undertake, and as a first step, may be a self-assessment exercise where an analysis of a process/product is made against a reference model; a sequent approach might be internal audits where an independent party inside the organisation will review processes/products against procedures or specifications of the organization in more in depth assessment; and finally, audits undertaken by means of an external organization – external audits – are seen as a more formal and exigent approach, for example, made against the ISO Norms, with the aim to get a certification.

Self-assessments

Self-assessment is a comprehensive, systematic and regular review of an organisation's activities and results referenced against a model/framework⁴.

The choice of the self-assessment tool is a strategic decision. It should be applicable to the environment of the organisation and to the processes to be assessed. Some aspects are important when undertaking these exercises:

- Team organisation – it is important that the team that will do the exercise of self-assessment are clearly informed about the model to use and the concepts behind it. It might be important to undertake a few preparatory meetings or even some training on the model. A good communication and transparent environment is needed. It is also important that the team believes in the model and that the effort will turn into an effective action plan;
- Preparation of the Self-assessment exercise – self-assessment is based on evidence, the team should be organised in a way that its members will gather documentation and indicators related to the assessed issues.
- Self-assessment exercise – once the evidences are gathered the team should discuss the state of the art of the processes that are being assessed by the model. Strengths and weaknesses are identified, scores will be marked (according to the model in use) and the team should try to reach a consensus on the main findings of the self-assessment.

⁴ Adapted from European Foundation for Quality Management (1999)

- Self-assessment report – the report should be structured according to the model in use for the exercise. It should stress strengths and weaknesses and should be very clear on an action plan. Teams should be involved in the implementation of the action plan, and top management should also be supportive, making available extra resources if necessary.

Auditing

“An audit is a systematic, independent and documented process for obtaining audit evidence⁵ and evaluating it objectively to determine the extent to which the audit criteria⁶ are fulfilled”⁷.

This international norm referred to above, from which the definition was taken, provides guidance on the audit principles, on how to manage audit programmes, and how to conduct audits to quality management and environmental management systems, as well as guidance on the competence of the respective auditors.

It assumes that auditing is a powerful tool that supports policies and management control actions, by providing important information that enables an organization to improve its performance.

This reference is also applicable to any organization that wishes to conduct internal or external audits of its quality management and/or environmental management systems or to the simple organization, planning and management of an audit program.

Even though an organisation has not developed a quality management system it can also be a reference for organising audits in any organisation. As such, this approach can be applicable to all processes in an organisation and to any type of organisation, a statistical organisation is no exception.

Audits can also be conducted both internally and externally:

- Internal audits are conducted with the purpose of reviewing the quality system (policies, standards, procedures and methods) and internal objectives, and are led by a team of internal quality auditors not in charge of the process/product under review.
- External audits are conducted either by stakeholders or by other parties that have an interest in the organisation; by an external and independent auditing organisation, or simply by an expert

⁵ Records, statements of fact or other information, which are relevant to the audit criteria and verifiable.

⁶ Set of policies, procedures or requirements.

⁷ In International Organization for Standardization (2002)

concerning the process/products that will be audited (that certifies that the quality and/or environmental systems are according to the prerequisites of the ISO 9001 and ISO 14001, respectively - in this last case it might mean that the organization is applying for a quality certification according to the ISO standards).

Both approaches have the function to control conformity with given policies, standards, procedures and methods – audit reference documents - in a systematic way and carried out regularly.

The ISO norm 19011, referred previously, may help organisations to organise the audit activity. But, in any case (even if the organisation doesn't take this reference) some issues have to be bared in mind when undertaking audits:

- Auditors (whether they are internal or external auditors), have to be recognised by the audited teams, as having the proper knowledge to undertake an audit. This means that auditors might have a specific knowledge concerning auditing, as well as concerning the activities that will be audited. So, the selection of auditors, especially when it comes to internal auditors, must be very careful, and training should be provided.
- Audits are conducted against audit reference documents, related to processes (procedures and/or working instructions) or products (specifications). Therefore, in order to perform an audit this type of documentation should be produced and implemented in the organisation, and everyone, audited teams and auditors, should be aware of them. They constitute the basis upon which audit criteria are defined.
- When conducting internal audits, the organisation should produce an internal procedure where the organisational aspects are taken into account. This procedure should make clear to everyone involved in the review process the following:
 - Audit reference documents;
 - Concepts/definitions;
 - Audit aims;
 - Audit planning requirements;
 - Responsibilities of every part involved;
 - Audits phases;
 - Auditors selection/recruitment;

- Auditors teams;
- Support documentation: audit Plan; non- conformity / observation form; audit report; corrective/prevention action form; follow up-forms; checklists.
- The ultimate “client” of an audit is top management, this means that top management should define the processes/products that will be audited in a certain period of time (e.g. in an audit annual plan).
- The preparation of an audit is one of the most important issues, for both auditors and audited teams. The audited teams should know in advance that their processes/products will be reviewed by “others”, in order to prepare documentation and everything that will facilitate the audit. Good communication in the auditing process is very important, as such auditing should also be seen as an involvement activity.
- While conducting an audit, auditors should promote the discussions with the audited teams that will allow the identification of improvement opportunities and quality improvement as a whole.
- The conclusions of an audit should be clearly summarized in an audit report, highlighting the improvement opportunities (that sometimes are related with bad results found in the audit), but also the strong points recognised in the process/product under evaluation. The report must be accepted by the audited teams and top management should consider it as a basis for an action plan. Audit reports should be made available to the whole team involved in the audit. If not the whole report at least a summary of the main findings should be publicly available to the whole organization. It is also important to state that the actions to undertake are linked to the report.
- The results of an audit should be “transformed” into an action plan. Once the actions are implemented it is important not to neglect a follow-up audit, in order to assure that the planned actions are effectively implemented and that the improvement opportunities and corrections actions are duly met.
- The auditing annual plan should also be evaluated in terms of its effectiveness. Activities must be audited on a regularly basis. These two factors must be taken into account when preparing the annual audit plan.
- Auditing is a time consuming activity. Depending on the scope of an audit, its length can vary considerably. The experiences show that in the case of internal audits, where processes are well documented, and the review does not go very deep in methodological issues, an audit can take 5

working days. If documentation is scarce and the audited teams do not prepare the audit properly, it will take longer. If an audit will take methodological issues into account it can take months. So it depends a lot on the scope of an audit.

- The experiences, on internal auditing, also show that an audit is undertaken by a team of two or three auditors, and that internal auditors do not perform audits as a full time job, normally they work in other areas of the organisation. Whilst external auditors may be professional auditors or specialists in the processes/products that are audited.

Peer reviews as a special case of external audit

One possible approach of an external audit is “Peer reviews”, that are often more informal, less structured and have the aim to assess at a higher level and not to control conformity with requirements item by item from a detailed checklist. Normally, peer reviews often do not concern specific aspects of data quality, but broader organisational and strategic questions.

“Peer review can be described as the systematic examination and assessment of the performance of a State by other States, with the ultimate goal of helping the reviewed State to improve its policy making, adopt best practices, and comply with established standards and principles. The examination is conducted on a non-adversarial basis, and it relies heavily on mutual trust among the States involved in the review, as well as their shared confidence in the process. When a peer review is undertaken in the framework of an international organisation – as is usually the case – the Secretariat of the organisation also plays an important role in supporting and stimulating the process. With these elements in place, peer review tends to create, through this reciprocal evaluation process, a system of mutual accountability”⁸.

Although not so formal, the methods to perform a peer review are very similar to what was already presented concerning audits in general. There are special concerns to the scope of the peer review, the peers themselves and the recommendations:

Scope – The scope of the peer review should be clearly defined, and prepared in advance by both parties.

Peers – Peers are chosen because of their effectiveness and quality in the process to be reviewed. Therefore they must represent an excellent reference for the audited teams.

Recommendations - The recommendations are highly important and should be made available in the organization and to the public as much as possible. They should represent an organization's commitment to future actions.

Recommendations

- One of the most important preconditions is top management support. Top management has to promote these activities and express, very clearly, that they recognise these approaches as powerful tools to identify improvement opportunities and to continuously improve quality of processes/products. Therefore, this leadership commitment has to be very clear within an organisation when preparing any type of audit or review activity.
- Documentation is also an important issue, since reviews are based on evidence. In any type of review, internal or external auditors have to base their evaluation on records (e.g. performance indicators) and documents that “prove” the methods and performance of the processes/product under evaluation.
- All staff related to process/product under evaluation has to be clearly informed about the objectives and methods of the review itself. A clear communication and the involvement of the staff are also needed.
- And finally, the results of the review must be clearly used by the organisation, in order to show how effective the reviews can be. Therefore, the results of reviews have to be consequent.

The two approaches – self-assessment and audits – are not independent activities. Although their methods are different, they can be combined efficiently. For example, an audit can be prepared by a self-assessment exercise using the Quality Assessment Checklist.

1.5 Labelling and Certification

Labelling

As the term indicates, the labelling method means that a label with a message is attached to something. In this context, (i) the label message is related to quality and quality assessment, and (ii) the label is attached to statistics, or a provider/producer of statistics.

⁸ In Pagani, Fabrizio, (2002)

Fulfilment of a set of quality standards is an illustrative example of a label message. In that case the label gives the users some information about internal procedures in the production of the statistics. Introduction of such a label may lead to user quality assessments that are more accurate than previously due to more information. A further possibility is that the user assessments get higher due to a gain in credibility. A credibility gain may be among the objectives of a label. Furthermore, fulfilment of quality standards has internal effects, and the labelling procedure can increase such effects. That may also be an objective.

The labelling method involves several choices, in particular the message and the subject to which the message is assigned. The wide range of choices may give the impression that the method is flexible. There are, however, several restrictions in practice. Above all, a fairly small number of labels should be used at the same time in order to avoid confusion among the users; to use many labels would be contra-productive. This implies that choices should be made with a long-term perspective in mind.

The attachment of a label needs a procedure to guarantee that the message is appropriate and true. There are two approaches with different time-scales in relationship to the labelling: ex-ante and ex-post. In the former case a procedure is in place first, before the statistics are produced, for example to assure that the quality standards of the label message are fulfilled.

In the latter case there is a check when the statistics have been produced that they fulfil the message, which could be related to the quality level of some quality components.

The label may be brief in itself, like “Official statistics”. If that is the case, explanations need to be given, for instance on the webpage, about the interpretation.

An important question concerns a possible failure. This should obviously be considered already when forming the labelling system. It would, for instance, be unfortunate and confusing with a mixture of labelled and non-labelled values in a time series. A label should only be introduced if it can be expected to remain. It may become necessary to stop some labelling, for example to change some statistics from official to non-official statistics.

Experimental statistics can also be considered as a way of labelling. These statistics are considered good enough to be published, and the publication may lead to feedback from users. They are, however, not as good as published statistics normally are. They are typically less

accurate, and they may have a limited coverage. The label points out the experimental statistics as such. It may also have the further aim to protect the ordinary brand name.

This is an advanced method, which means that the experience is somewhat limited. There have been only recent discussions in relationship to the international organisations [Hahn and Willeke, 2006]. Some national institutes have introduced procedures similar to labelling but perhaps without that term (for instance UK, Sweden, and New Zealand).

Recommendations

The method should be decided on a high organisational level. The choice has to be careful with a long-term perspective, e.g. since many different labels would be counter-productive.

- Moreover, when a label has been introduced it should be kept for some time.
- The message should, of course, be easy to understand for the users.
- As mentioned, there is a methodological choice between commitment-in-advance and attachment-after-checking, which can briefly be called *ex ante* and *ex post*, respectively. In either case a procedure for follow-up has to be included, e.g. a checklist related to the quality standards to be obeyed.
- It is important that those in the staff who are involved are well acquainted with the label message and well prepared for the procedures to be used.

1.5 Certification to the International Standard on Market, Opinion and Social Research (ISO 20252:2006)

The certification to an international standard is an elaborated method of an external audit and is combined with a kind of “label” because the standard is internationally recognized as a guaranteed level of quality. Since the International Standard Organisation (ISO) has published “ISO 20252:2006 (E) Market, opinion and social research – Vocabulary and service requirements” there is for the first time set up an international standard in the field of data quality.

The principal objective of international standardization is to facilitate business development and growth particularly between different national and regional markets. The intention of ISO

ISO 20252:2006 is to apply the principles of international quality standards to market, opinion and social research and to harmonize other national standards already available.

The decision to apply ISO 20252:2006 to official statistics has to take into account the different conditions of business enterprise and public service as a survey research supplier in regard to the respective statistical system. Official statistics complies with most of the requirements of the standards, but it may require numerous adjustments and improvements to comply with all.

The benefits of ISO 20252:2006 are:

- An external audit by an independent auditor can contribute to strengthening trust in official statistics.
- The system of ISO is transparent because the specification is openly drafted; there are no barriers to participation, it is published and required to be regularly updated.
- The audit requirement is clear and the assessment procedure specification enables an application that provides consistency and comparability for participants
- It provides a set of minimum standards that have an audit trail for their verification by an approved and independent third party.
- Within a statistical office the need to clearly define processes and their ownership achieves a higher level of staff involvement and comprehension of the processes.
- Quality standards, by identifying where, when, what, how and why errors occur improve efficiency and reduce costs. Good quality proves cheaper.
- The increased awareness of process quality brought about by standard compliance, enables staff to become more pro-active in seeking quality improvements.

The costs of ISO 20252:2006 are also to be considered:

- The introduction of some kind of Quality Management System (such as EFQM, CAF, TQM, Balanced Score Card) is a prerequisite.
- The certification of quality management to ISO 9001 is not necessary, but helpful.
- The costs of documentation and keeping the documentation up to date are high.
- It may be required to invest in changing/improving processes. The certification process itself requires some resources.

ISO 20252:2006 is a Process Quality Standard. The full standard in translation is available from local national standards agencies. The core content is sections on:

- Quality management system requirements
- Managing the executive elements of research
- Data collection
- Data management and processing
- Project documentation

Having been adopted in spring 2006, the ISO 20252:2006 is, clearly, too new to have been experienced in statistical authorities. Nevertheless the future approach can rely on multiple experiences with the equivalent local standards, which date back to the mid-nineties.

An international service industry quality standard raises a number of major implementation issues. It is critical to the credibility and success of the standard that it is implemented in a manner that results in consistent and comparable assessment and certification between countries, assessment bodies, applicant enterprises and locations.

Certification to ISO Standards is an advanced method/tool of process quality management. It requires quality reports, self assessment, documentation, quality indicators and audit as mentioned elsewhere in this document.

It is helpful, but not required to certify according to ISO 9001. On the other hand, ISO 9001 presents a general standard suitable for any type of organisation, recommended for creation of a proper process basis. An elaborated approach is: to implement ISO 9001 and to develop further by implementation of specific requirements of other systems (ISO 20252:2006, EFQM, etc.). To make changes, the following two steps are recommended.

Recommendations

Step I

- review existing quality systems procedures against ISO 20252:2006,
- identify changes needed in working practice and quality system documentation to meet new standard,
- amend quality system documentation and implement required changes in working practice,

- do internal audits to ensure effectiveness of implementation.

Up to now it is sufficient to proceed up to this point, because an international coordinated assessment process is just developing.

Step II

- Make arrangements with external assessment body to assess change.

To become ISO certified, an agency has to ask an accredited auditor to assess whether it meets all requirements, such as having a quality management system in place, keeping proper records, giving feed back to employees, reporting to clients on project progress and key decisions and all other quality procedures.

“If senior management is genuinely committed to delivering good quality and service, implementation can be very fast. Still, it may take several years for a committed company starting from zero to become fully ISO certified.” (Enrique Domingo, Coordinator of the international adoption of ISO 20252:2006).

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