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Guidelines for the implementation of quality assurance frameworks for international and supranational organizations compiling statistics

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Committee for the Coordination of Statistical Activities
and
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Guidelines for the implementation of quality assurance frameworks for international and supranational organisations compiling statistics

August, 2009[1]

[1] This is an updated version of the guidelines presented to the Committee for the Co-ordination of Statistical Activities (CCSA) at its meeting in September 2007 [CCSA, 2007]. It takes into account comments received from members of the CCSA and as well recent developments on quality. The aim of the document is to further support the work of the CCSA for enhanced quality assurance of statistical processes and outputs from international organisations compiling statistics.

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- Executive Summary -

In 2005, the Committee for the Co-ordination of Statistical Activities (CCSA) endorsed a set of principles for the enhanced functioning of international statistical activities [CCSA, 2005a], which provides an overall infrastructure to support the improvement in the quality of interdependent global statistical systems, thus enhancing the credibility of the statistics. However, the CCSA Principles need to be implemented by individual international organisations for their statistical processes and corresponding statistical outputs.

Therefore, the CCSA supported in 2005 a Eurostat co-ordinated project on the use and convergence of quality assurance frameworks [CCSA, 2005b] for international organisations 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 more integrated.

One major deliverable from the project was the guidelines "Implementation of Quality Assurance Frameworks for International Organisations Compiling Statistics" [CCSA, 2007]. The Guidelines presented 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.

This document is an updated version of the guidelines described above and takes into account comments received from the members of the CCSA and as well recent quality assurance developments. This version of the guidelines also covers better the monitoring of quality assurance requirements for all aspects of statistical output quality and the underlying process quality. Such data quality information should be embedded into international statistical reporting systems.

The various elements of different existing quality initiatives are brought together in a model for statistical quality assurance frameworks that could be either applied in its entirety by an individual international organisation or modified as appropriate to meet its needs / statistical environment. Thus, recognizing that a one size fits all solution is not possible and that the framework provided is intended only as a model that should be tailored to the specific needs of each international organisation, taking into account the institutional environment, quality management system in place, the magnitude of an agency’s statistical activities where often statistics production belong only to an arm (department, unit, etc.) of the agency, and resources available.

Implementing international quality assurance framework would contribute to the effective management and improvement of the quality of the statistical output of international organisations, increasing the credibility of international statistics and their compliance with the CCSA Principles.

PART I: OBJECTIVES, CONTEXT AND QUALITY MODELS

1 Introduction

1.1 Objectives

The specific objectives of these guidelines are:

- To promote the use of a quality framework in international organisations for assuring the quality of the statistical processes[2] and outputs;
- To harmonise the existing quality frameworks for international organisations leading to the development and implementation of common standards, sharing of good practices for statistics compilation, and reduced quality reporting burden among producers of cross-national statistics.
- To provide a set of quality assurance methods and tools that can be used for regular monitoring and evaluation of the quality of statistical outputs across statistical processes and over time;
- To facilitate the practical implementation of data quality assessment in international organisations.

The use and convergence of quality assurance frameworks are promoted by building on and further integrating common international statistical standards and recommended practices.

These guidelines extend recent quality work carried out by a number of national and international organisations. All sources used are cited but in some cases parts of reference material have been extracted directly, or only slightly modified, since they were considered to be of direct relevance.

1.2 Context

Quality is interpreted in a broad sense, encompassing all aspects of how well statistical processes and statistical outputs fulfil key stakeholders' expectations. High quality is, therefore, associated not only with meeting both internal and external user expectations regarding the availability and information content of the disseminated data, but also addressing respondent and data compiler concerns in the production of statistics, and promoting the skills and ethical standards of statisticians.

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

When designing and implementing quality assurance frameworks for international organizations producing statistics there are several specific characteristics that have to be taken into account:

First, and in common with national agencies, the institutional set-up of each international organisation can be quite different in terms of governance arrangements (independence,

[2] In this document, a statistical process is defined as the collection, processing, compilation and dissemination of statistics for the same area and with the same periodicity.

accountability, responsibilities and regulatory power concerning data collection, etc.) as the statistical unit is often a functional department of a larger organization.

Second, international organisations often re-disseminate data supplied by national statistical authorities usually with little transformation and only in a few international organisations with more extensive aggregations of cross-national data.

Third, international organisations increasingly share the statistics with other international organisations.

Fourth, international organisations are actively involved in the development of methodological standards agreed upon at the international level.

2 Quality Management Models

The aim of this chapter is to describe in the way a quality assurance framework have to be interpreted within the context of existing (international) quality management models.

2.1 Total Quality Management (TQM)

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

2.2 Quality Policies

The UN Statistical Commission provides guidance to international and national organisations on the sort of environment within which quality management can flourish through the two documents.

- The UN Fundamental Principles of Official Statistics [UN Statistical Commission, 1994] for national statistical systems were promulgated by the UN Statistical Commission in 1994. There are ten principles, and whilst none of them explicitly relates to quality, they are all fundamental to establishing a quality management system.
- The UN Principles Governing International Statistical Activities [CCSA, 2005a] were adopted by the UN Committee for the Coordination of Statistical Activities in 2005 and promulgates an equivalent set of principles for international organisations compiling statistics. For each of the principles, a set of good practices are provided further promoting the implementation of the principles for enhanced functioning of the international statistical system.

2.3 Quality Standards

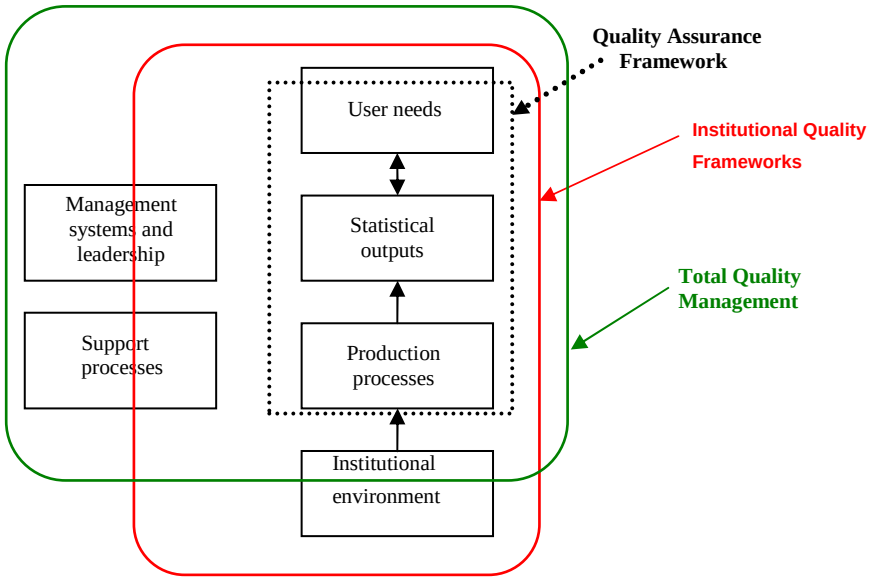
There are a number of quality standards widely used in the world (such as the ISO 9000 series; the EFQM Excellence Model; the IS0 20252:2006 Market, Opinion and Social Research; Six Sigma; and Balanced Scorecards) that are all building on the principles of Total Quality Management. With the exception of ISO 20252, these quality standards are intended to cover all organisations whatever their organisational structure, processes and products and

are thus expressed in very general terms. Accordingly, in the context of official statistics a further specification of these models is needed and they are therefore not further described in this document.

2.4 Quality Frameworks

The major objective of the quality frameworks developed by the international statistical community is to guarantee a certain number of minimum requirements. These minimum requirements in the first instance concern basic institutional features, like professional independence, the legal mandate for data collection or the measures taken to guarantee statistical confidentiality and to assure impartiality. Besides such institutional aspects, often further aspects concerning statistical products and statistical processes are dealt with in some detail. However, they differ from one another at the product and process level and in covering various statistics. Examples of such quality frameworks are the Data Quality Assessment Framework (DQAF) of the IMF [IMF, 2003], the Quality Framework and Guidelines for OECD Statistics [OECD, 2003], the European Statistics Code of Practice [European Commission, 2005] and the ECB Statistics Quality Framework [ECB, 2008].

Figure 1: Quality frameworks and how they relate



The institutional aspects, being very important in the context of official statistics (like the political and legal frameworks) are not considered as part of the TQM model as they are normally regarded as external constraints, given that they are not under direct control of the organisation. In general, institutional frameworks do not cover the full range of processes as do TQM models and, as such, are not necessarily as focused on the operational aspects of quality.

Generally, the principles in quality frameworks form the underlying superstructure to all other measures which are later described at the product and process levels. 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.

PART II: QUALITY ASSURANCE FRAMEWORKS

3 Scope and Uses of Quality Assurance Frameworks

A quality assurance framework builds upon the mentioned TQM approach by providing more detailed guidelines 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 [Eurostat, 2007a]. 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 methods.
- 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 assurance[3] 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.

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 with the term ‘quality framework’ or ‘quality assurance framework’. 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

[3] 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 decisions taken on how to implement these measures.

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.

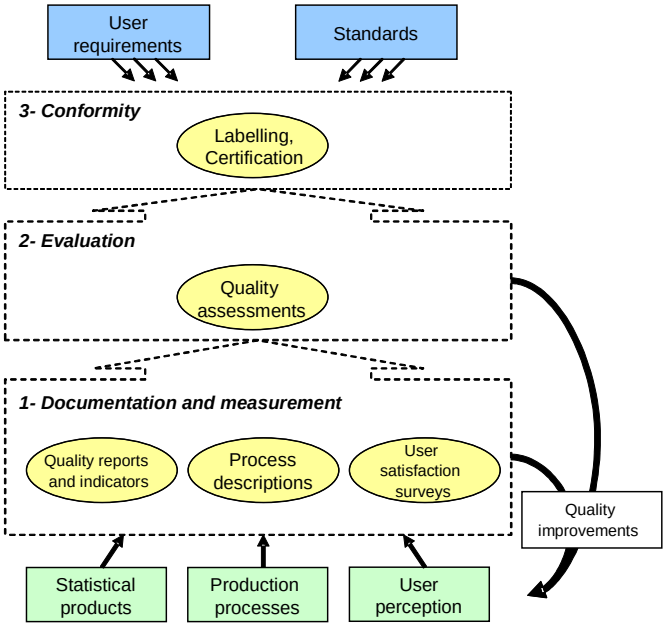
These other initiatives for improving the overall management system of an organisation complement the implementation of the quality assurance framework and are often related to the development of process-, project- and risk management tools as well as internal control standards. The tools are designed 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).

4 Quality Assurance Methods and Tools

For implementing quality assurance a set of concrete measures (e.g. quality documentation, quality assessments, quality reviews etc.) have to be defined and a decision on how to achieve them is needed.

Figure 2 below shows how different quality assurance methods and tools tend to be either closer to the documentation for the producer side or closer to the standards and user requirements for the user side [Eurostat, 2008a]. 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 to managers and users. Here, three layers of quality assurance methods and tools are distinguished and followed by a description of the quality improvements process.

Figure 2. Quality assurance methods and tools



The application of quality assessment methods always requires some basic information including a documentation system giving access to key characteristics of the processes and outputs under consideration. Furthermore, 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.

4.1 Documentation and measurement

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

4.2 Evaluation

Based on information compiled in the first layer, the conformity of statistics is evaluated against (internal or external) standards. Evaluations can range from self-assessments by the producer to quality reviews undertaken with 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, quality reviews may introduce a neutral (and sometimes external) expert and cover both rolling reviews and peer reviews. Rolling reviews often entail the use of several methods and tools to obtain a better assessment of statistical products, including their relevance for producers and users.

Self-assessments and quality reviews might use specifically designed checklists (e.g. The International Statistical Processes Assessment Checklist) to facilitate the compilation and presentation of information needed for the quality assessment in a more structured and accessible way. Such checklists may entail the compilation of more qualitative information than, say, the use of more quantitative process variables, quality indicators, quality reports and user satisfaction surveys.

4.3 Conformity

The methods of labelling or certification further condense quality assessment information and demonstrate to users and the general public the compliance against the set of defined standards and requirements. Labelling, as the term indicates, consists of providing any kind of label to the statistics or the processes that conform to pre-defined quality requirements. Labelling also aims to compliance with ethical and scientific principles for statistics production and, thus, it can help to enhance trust and credibility in official statistics. The certification to an international standard (such as the ISO series) is combined with a "label" because the standard is internationally recognized as a guaranteed level of quality.

PART III: IMPLEMENTATION OF QUALITY ASSURANCE FRAMEWORKS

5 How to Apply Quality Assurance Methods and Tools

Quality assurance should build on a general implementation strategy and be applied systematically across the range of an organisations statistical outputs. However, the implementation of a quality assurance framework also has to be tailored to the institutional environment and the statistical activity. Such preconditions for quality assessment concern the standards of what has to be assessed and the size and importance of the statistical activity. The assessment of a small scale statistical activity might only require basic documentation and measurement, while a major activity (in terms of political importance and / or resource usage) might require more comprehensive quality assessments guaranteeing the quality of statistics, including labelling.

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

- the office-wide quality management approach;
- institutional preconditions (procedures and legislation);
- assessment methods already in use;
- relevance (size and importance) of the statistics including production periodicity and the existence of specific legal framework.

This requires as a first step, the identification of the statistical outputs of an organisation, the identification of the statistical processes used to produce each output, and their characteristics, and the mapping of the processes with the types of quality assessments to be used.

Other factors also need to be taken into consideration when planning quality assessments. Human resources involved in the process, the periodicity of outputs, whether a legal basis exists 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 international organisations, and the degree of internal control in the management of the process.

For some statistical domains, with low periodicity and under "gentlemen agreements", the use of quality reports and self-assessments might be sufficient. For other statistical activities, other tools might be necessary for the assessment. These entail the use of quality surveys, objective information (quality indicators) as well as an evaluation by (external or internal) experts in reviews and by users in user satisfaction surveys.

An evaluation or review will also incorporate changes in the production processes. Process quality is normally at least in part covered by self-assessments and audits. Continuous process improvement requires the systematic measurement of the performance of the various production processes. Key process variables can be used for an assessment of process quality and should be conceived together with the quality indicators.

Although labelling is not quality assessment in the strict sense, it is a tool for communicating quality standards to users. Labelling can only be used where the necessary standards are in place. Such standards will normally be (co-)defined by the statistical organisation. So far, no international organisation has implemented the process of labelling of their statistics.

It is important to stress that the same type of quality assessment should be applied for all processes considered for assessment that have the same characteristics.

The application of quality assessments methods requires as precondition that information on quality is available for the statistical process to be evaluated. The situation may run from complete information (including the description of the statistical process, full quality reporting of the outputs and users views) to synthetic information on quality, usually in the form of some key quality indicators.

Quality assessments take as input the existing quality information, evaluate the statistical process and its outputs against some pre-fixed standards, identify strength and weaknesses and derive the corresponding improvement actions. Fulfilling the shortcomings addressed in the improvement actions will enhance the statistical process and its outputs as well as users perception, reaching a new step in the documentation layer so that the statistical process will be ready for a subsequent evaluation. This procedure will continue until the pre-fixed standard are fully met leading to the conformity layer which includes labelling.

6 Quality Documentation

6.1 Quality reports

Quality reporting underpins quality assessment, which in turn is the starting point for quality improvements, altogether being summarised as quality assurance. A quality report can range from very short and concise to very detailed depending on the purpose of the quality report. All producers of statistics needs full scale reports with qualitative and quantitative information dealing with all important aspects of output and process quality in detail. Thus, the quality reports require not only a description of processes and quality measurements but also quantitative quality assessments. Even though the producer oriented quality reports should contain all information needed for assessing the quality, it should be simplified as far as possible in order to minimise the reporting burden. Data quality information disseminated to the users should focus on the main quality aspects of importance for correct use of the statistics. This often requires more explanatory information on how to interpret the quality information in the specific statistical context.

Statistical organisations have worked extensively on the development of more operational definitions of quality and there is considerable convergence in the data quality concepts and the main quality components (also referred to as “dimensions”, “aspects”, “elements”) among international statistical organisations that have developed explicit quality definitions. They are all essentially along the same lines, and include in broad terms the quality components: relevance, accuracy, timeliness, punctuality, accessibility, clarity/interpretability, coherence/ consistency, and comparability. However, the existing situation could be further improved by promoting the further convergence towards the use of one set of main quality components and the use of common definitions of these components[4].

[4] Some organisations (such as IMF) also include aspects such as pre-requisites of quality, assurance of integrity and credibility. These 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

For a common terminology, the Metadata Common Vocabulary (MCV) is the SDMX (Statistical Data and Metadata eXchange[5]) repository which contains definitions and related context descriptions of all these quality components. Each international organisation can map their own quality concepts against the generic set of quality aspects mentioned above and use terminology, descriptions and definitions of the quality components from the MCV.

The set of 62 Cross domain concepts, included in the SDMX Content-Oriented Guidelines, are usable across statistical domains for describing either data structures or metadata structures. 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 minimising 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.

The efficient exchange of metadata between national and international organisations requires the use of standard formats and concepts for automatic reporting and re-usability as described above. It would be useful to enhance the implementation and the availability of metadata on quality by defining a common framework for both producer oriented and user oriented quality reporting promoting further the existing standards and as well guidelines on how to report in practice. Such guidelines should state for each quality component what should be reported and also illustrate by the use of good examples on how to report the quality concepts in practice. This would lead to improved quality reporting and minimised reporting burden. It should also lead to more harmonised and hopefully better documentation.

6.2 Quality indicators

Quality and performance indicators can be used for setting quality requirements for statistical output quality and the underlying process quality. Standardised quality and performance indicators would contribute to meet the quality assurance requirements that all aspects of the statistical quality can be monitored on a regular basis. The set of quality and performance indicators should be selected in order to be representative for the respective quality criteria and in principle applicable for all statistical processes and their outputs.

More specifically they will allow:

- the production managers to evaluate that their specific production process are fulfilling the quality requirements/ targets.
- the domain managers to compare the quality indicators with appropriate average values for benchmarking purposes across statistical processes;
- the top-management to have highly synthesised quantitative information for strategic decision making purposes;
- the users to analyse the characteristics of the statistics and to compare the quality of different set of statistics (across domains and countries).

Quality indicators make the description of the quality of statistical outputs more informative and increase transparency. However, indicators always simplify reality and there is a danger of false interpretation of quality indicators if the background information is not taken into account as well. When quality indicators are used to inform users on the quality of statistics, it

component "methodological soundness" is singled out in some of the existing quality concepts. This covers important aspects related to internationally 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, accessibility and coherence.

[5] http://www.sdmx.org/

is recommended to include qualitative statements helping to interpret the quality information as such and the main effects for the usability of the statistics.

Some quality indicators should be produced for each output in line with the frequency of the production or the dissemination (e.g. coefficient of variations should be calculated related to each new key estimate). However, some quality indicators should be produced once for longer periods, and should only be recalculated when major changes occur (e.g. time lag between the end of the reference period and the date of first results). Thus, the calculation frequency of the indicators depends on the purpose of the quality indicators (e.g. monitoring the quality over time) or on the specific statistical processes or on the publication frequency.

The set of ESS Quality and Performance Indicators (annex 2) can contribute to provide synthesised information on the level of the quality of the statistical outputs for specific statistical processes, similar statistical processes, across countries and over time. Detailed guidelines [Eurostat, 2009] have been developed for supporting the implementation of the ESS Quality and Performance Indicators since standardised and clearly defined methodology for the calculation of the quality indicators is the basic precondition for being able to undertake meaningful analyses of the statistics.

6.3 Process descriptions

Process quality is less straightforward in its definition, and there are no standard definitions in place, as for product quality. However, several existing quality frameworks also cover statistical processes, and even focus on processes as the operational target of the quality work, since it is through use of these processes that many product characteristics are determined. Such process requirements comprise: sound methodology, appropriate statistical procedures, non-excessive burden on respondents and cost effectiveness.

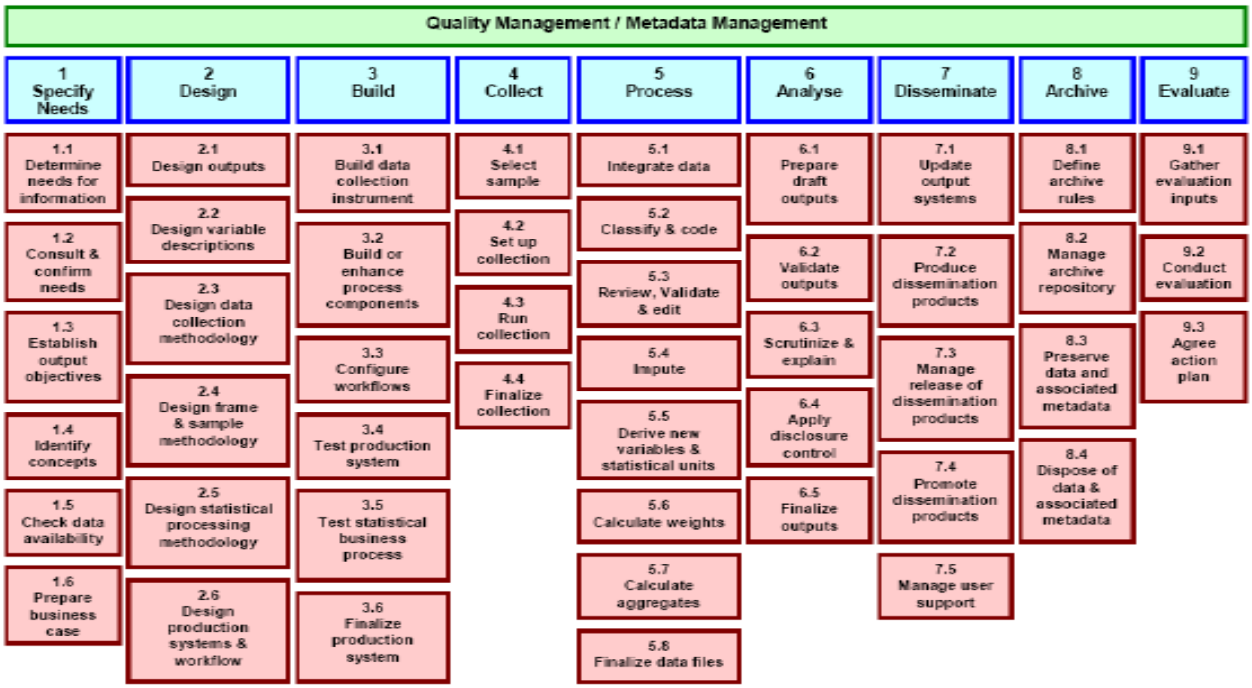
Key process variables are usually referred to as those variables with the largest effect on product characteristics such as the product quality components mentioned. They will vary by product quality component and by type of process. Typical process variables are resources and time used, response rates 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 assessing 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.

The Generic Statistical Business Process Model[6] (version 4.0 was approved by the UNECE-Eurostat-OECD Work Session on Statistical Metadata (METIS) Steering Group for public release in April 2009) is a flexible tool to describe and define the set of business processes needed to produce official statistics. In principle, a business process model may include the processes and sub-processes in figure 3.

[6] Current and previous versions are available at the website: http://www.unece.org/stats/gsbpm

Figure 3. The Generic Statistical Business Process Model (version 4.0)



It should be noted that not all steps are applicable to the international organisations compiling statistics. However, the adoption of the Generic Statistical Business Process Model provides a central framework against which processes in national and international organisations can be mapped. This, in turn, provides a mechanism for benchmarking systems, processes and process quality between organisations, increasing the possibilities for sharing data and metadata systems and applications.

6.4 User satisfaction surveys

The product quality components could also be used as a framework for the assessment of the user perception of a statistical product.[7] It should be noted that the quality components are the same, but users might perceive product quality differently than producers. Furthermore, some of the quality components are difficult to assess by the user. For example, an assessment of the accuracy of statistics requires at least some basic knowledge of statistical methodology. For the same reason, it will not even be easy for non-expert users to clearly define their quality requirements. Other quality components, such as 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 users and in relation to the stated and implied needs of the users. To collect information on the expectations/ needs and satisfaction of the different users is therefore a basis for prioritising improvement actions.

Two examples of existing user surveys in international organisations are:

- The survey requested by the IMF prior to a country's Data Review of Standards and Codes (Data ROSC)[8] comprises two parts. The first part aims at identifying the users' area of interest and the use of statistics, whether they use metadata and at specifying the

[7] The OECD includes credibility as an extra quality dimension.
[8] For more information please refer to: www.imf.org

sources from which they obtain the data. A second part focuses on the statistics' quality addressing for each statistical area the different quality aspects. It can be seen as a model questionnaire since it contains a tested and widely used set of questions.

- The user satisfaction surveys conducted in the European Statistical System [Eurostat, 2008b] in order to monitor the compliance with the European Statistics Code of Practice. The surveys largely built upon the IMF questionnaire since the European Statistical System not only relied on a tested and widely used set of questions but also ensured to exploit synergies with the IMF activities either where the survey had already been conducted recently or where it could serve a future IMF Data ROSC.

  The Eurostat survey largely built upon the standard European Statistical System's version but was adapted to the specific needs of Eurostat with a focus on the following elements:
  - coverage of all the statistical areas mentioned on the Eurostat web-site;
  - questions on the type of user;
  - limitation of quality dimensions on those most relevant in the European context;
  - comparison with statistical data from other international organisations rather than with country data.

  Eurostat implemented the survey in two different ways. The first inquiry, launched via Internet, was open to registered users. The second inquiry, using email, was addressed to main users identified by Eurostat and covering Commission services, international organisations such as IMF, WB, OECD, FAO, WTO, UNECE, Council committees and others.

In general, common methodological approaches for user satisfaction surveys needs to be further developed and agreed upon, and more practical guidelines are needed for:

- Timing, frequency and regularity of user surveys.
- Target population and type of satisfaction surveys (like expert users and internet users).
- Data collection modes.
- Themes/ domains to be covered.

7 Quality Assessments

Quality assessments are an indispensible step toward the highest possible quality of statistics. There are three data quality aspects:

– The perception of the statistical product by the user

– The characteristics of the statistical product(s)

– 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.

Quality assessments will make these choices explicit, thus fostering an informed discussion about the quality of statistics. At the same time quality assessments allow for systematically reviewing the various steps of the statistical value chain against pre-defined benchmarks, thus providing a basis for further optimisation of data quality. Finally, quality assessments also create synergies with other initiatives.

7.1 Methodology for Quality Assessments

The assessment methods for statistical processes and outputs have to be tailored according to the relative importance of a statistical activity. This requires the identification of the statistical processes and their characteristics and the mapping of the processes with the types of quality assessments to be used. The same type of quality assessment should be applied for all statistical processes belonging to the same category (annex 1). The "International Statistical Processes Assessment Checklist" [CCSA, 2009] can be used as a main tool for all types of quality assessments.

7.2 The International Statistical Processes Assessment Checklist (ISPAC)

The assessment procedure illustrated relies on the "International Statistical Processes Assessment Checklist" (ISPAC). The ISPAC has been designed to meet different needs.

– First, it is an assessment tool, which provides an overall picture of the quality of both the statistical output and the underlying statistical production process. It should be used to identify areas where improvement is most needed.

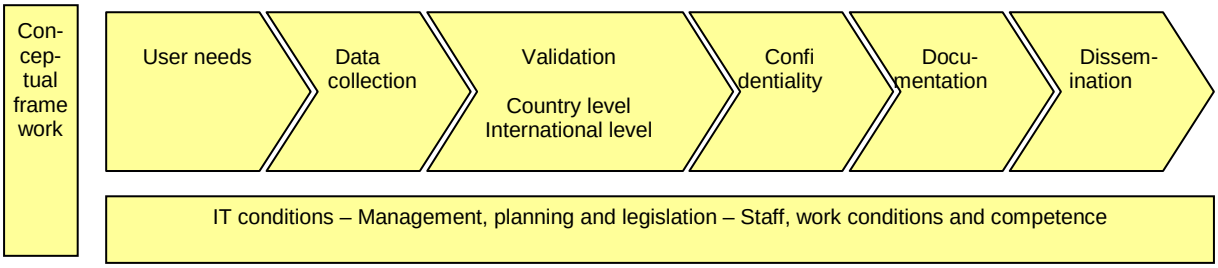
– Second it provides guidance in the consideration of potential improvement measures that could be implemented in the statistical production process.

– Third, it provides a means for comparisons of the level of quality over time and across similar domains. However, as results are subjective, it should be kept in mind that careless comparison based on the checklist can be misleading. More reliable comparison can be achieved through comprehensive quality reports.

– Fourth, it is a helpful tool to identify – in the statistical production chain – good practices throughout the organisation and promote those for application.

The ISPAC examines chronologically all the steps in a given production process, from the definition of user needs to the dissemination of results. It corresponds to large extent to the Eurostat Statistical Processes Assessment Checklist (ESPAC). The latter is built on the DESAP [FSO Germany, 2003] for national statistical institutes but underwent extensive modifications to fit the particular needs of international organisations. In particular, the aspects on data validation have been split into two modules, one referring to data validation undertaken by countries and the other to the data validation done in international organisations.

Figure 4. The International Statistical Processes Assessment Checklist (ISPAC)



The completion of the ISPAC allows obtaining three tangible outputs:

– A Summary Assessment Report presenting the principal strengths and weaknesses of the investigated domain with the resulting recommendations for improvement and identification of good practices. Identified strengths can be used for benchmarking purposes (such as setting targets or sharing of best practices) within and between statistical organisations. Identified weaknesses can form the basis for a quality action plan that can be used for launching and monitoring of quality improvement actions.

– An Assessment Diagram graphically illustrating the results of quality measurement. It is useful for summarising strengths and weaknesses of the assessed statistics. If the checklist is reviewed on a regular basis (i.e. every year) the quality level of the same set of statistics can be easily monitored.

– The description of a good practice identified during the assessment. This will foster the adoption of these good practices in other statistical production processes.

PART IV: COSTS, BENEFITS, CONCLUSIONS AND OUTLOOK

8 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 communication as well as for identifying and becoming informed about best practices. Existing quality frameworks should be a starting point and further adapted to the particular circumstances. The costs are staff costs. The staff with the skills required to lead the design of a quality framework are usually in great demand for other design work as well. 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 assurance 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. The production units within the organisation are responsible for managing quality of the statistical processes under their control, 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 an international organisation with less developed statistical infrastructure or in the process of changing the statistical production system, the quality assurance framework may be of more explicit importance. It can provide a mechanism for both (relatively major) re-engineering 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 assurance. 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.

A quality assurance framework should always acknowledge performance/ cost.

9 Conclusions

The guidelines and recommendations outlined in this document are intended to promote the use and convergence of quality assurance frameworks. It is recommended that each international organisation should have a quality assurance framework in place tailored to its own statistical environment and needs whilst being compatible with each organisation office-wide procedures and rules. Making the quality principles applied and quality assurance

procedures followed in a set of documents available on a dedicated web site would further increase transparency of the statistical procedures, as well as providing a benchmark within the organisation.

The convergence of quality assurance frameworks used by different international organisations can be achieved by bringing the frameworks into alignment as regards concepts and standardising their content. This would lead towards a smaller number of quality frameworks and have as an effect the standardising of terminology for the benefit of all concerned – producers and users; promoting current best practice; and reduced reporting burden.

The replacement of separate frameworks by a single one in practical terms is neither achievable nor recommended. 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 information and communication technology (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.

The described quality assurance framework activities for the enhancement of quality of the statistical outputs have focused on the importance of having good quality in the underlying production processes generating an output with quality. If the process quality do not meet the required standards it is unlikely that the end product quality will be good. So improving process quality is a key aim and any substantial quality improvement will require the necessary changes in the production processes.

It is also clear that there are a number of business processes involved in the production of statistics, and that these have to be described, measured and analysed. In addition, this kind of quality assessment requires, as a frame of reference, the definition of minimum requirements, guidelines or recommendations against which the performance can be assessed.

A standardisation of production processes based on the development of technical standards, current best methods for statistics production, protocols and policy documents largely facilitates effective data quality assessment and data quality improvement.

10 Outlook

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.

When undertaking further efforts to develop and implement standard tools and methods it has to be recognised that the current way of producing statistics is, however, no longer fully adapted to the changing environment. A changing environment where the statistical system architectures have to take into account new data need that are more and more complex.

Statistics for specific domains are then no longer produced independently from each other; instead they are produced as integrated parts of comprehensive production systems. Such systems would be based on common infrastructures, they would apply as far as possible

standardised software, and they would make use of all available data sources which are appropriate in quality.

A very efficient way to facilitate process integration is for all actors to use the same tools to perform the same functions. It is probably the best way to ensure the convergence of methodologies and the comparability of outputs, facilitating as well the automation of parts of the processes.

As the statistical production processes become more complex and integrated the current approaches for assuring quality in all its dimensions have also to be reconsidered and fully built into the future statistics production. It is likely that additional indicators of the quality components will be needed in the future. The relevance of statistics should involve offering better targeted datasets to more users and the coherence of the statistics disseminated should be much better in a warehouse type production setting. At the same time the accuracy criterion will need to be reviewed given that error estimation becomes much more complex and additional quality measures are likely to be needed.

The international statistical community has the challenging tasks to define more general strategies encompassing both ICT infrastructure and quality issues necessary to guide 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 statistics.

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ANNEX 1. Methodology for quality assessments

The next paragraphs outline a methodological approach for quality assessments in practice. The assessment methods for statistical processes and outputs are tailored according to the relative importance of a statistical activity: this requires the identification of the statistical processes and their characteristics and the mapping of the processes with the types of quality assessments to be used. It is assumed that all the assessments rely on the "International Statistical Processes Assessment Checklist" (ISPAC).

Step 1. Identification of the importance of the statistical process

Statistical processes are quite divers and need to be characterized according to some basic criteria. The importance of the output produced is a key element for assessing the importance of the process. The productions of key outputs or contributions to official reports are important elements for deciding on the importance 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, weather a legal basis exists or not, the type of data (surveys, administrative/accounting, or mixed data), the intervention of countries in the data collection and transmission to the international organisation, and the degree of the international organisations' control in the management of the process, need to be taken into account when planning quality assessments

Step 2. Categories of quality assessments

Here, four categories of assessments are singled out: self-assessments, supported self-assessments, internal and/or external peer reviews and rolling reviews. In all of them, the ISPAC is assumed as a main tool for the assessment. The main difference between the categories is the degree of external intervention in the assessment.

Self assessment

In a self-assessment, the Checklist is filled in by the person (or team) responsible for the statistical process. The role of the quality team (or similar) is to assist the statistical process manager during this process and to ensure, to the extent possible, the coherence of assessments across the organisation.

Supported self-assessment

In a supported self-assessment, the Checklist is filled in under the responsibility of the statistical process manager with extended support from the quality team. Thus, the burden placed on the production unit/ team is reduced and a high degree of coherence of assessments across statistical processes (and over time) is ensured.

Peer review

In a peer review, the procedure is similar to that used for a supported self-assessment, except that an expert, not belonging to the production unit/ team, is invited to take part in the assessment. The reviewer brings in technical expertise in the domain being assessed and increased objectivity, making for greater credibility of the assessment.

Rolling Review

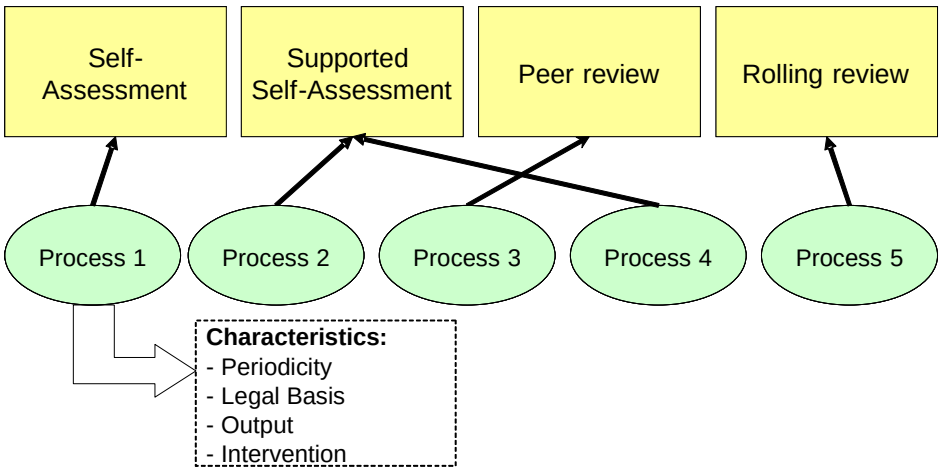
In a Rolling Review a more complex assessment of the statistical process is implemented by reviewing the statistical data, the process to produce them, the interactions with data providers

and the user satisfaction. Often, the rolling reviews are implemented by an external contractor while being supported by the quality team and/ or the evaluation function of the organization.

Step 3. Mapping of statistical processes with types of quality assessments

For processes considered to be assessed, the same type of quality assessment should be applied for all processes having the same characteristics. Figure 5 below illustrates how to map groups of processes with type of quality assessment:

Figure 5. Matching processes with assessment categories



For example, the following basic criteria can be applied for mapping groups of processes with type of quality assessment:

- For processes with low periodicity, no legal basis and producing low visibility outputs, self-assessments (which are the bottom line of quality assessments) seem to be suitable. For these processes the availability of limited quality reports, prior to the self-assessment might be sufficient, given the investment needed for producing full quality reports.

- For processes involving important financial resources and a high number of staff, with short-term or yearly periodicity, which are in the front line of user's demands of statistical outputs, rolling reviews (which is the most intensive quality assessment) should be reserved. Such rolling reviews are quite resource intensive and should therefore 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 specifics of the process and the opinions/demands of the process owners.

Quality measurement regarding processes and outputs has to be in place before quality assessments are conducted.

Step 4. Principles for implementation

A successful implementation of quality assessments is conditioned on the level of involvement and ownership of the exercise by the production teams. In this context, the assessments are set up taking into account the need to minimise the burden for production

units and applying high flexibility regarding the timetable and the category of assessment. The assessments, an element of evaluation within the quality assurance framework, heavily build on the already existing documentation and measurements related to quality, like quality reports, process analysis, user satisfaction surveys, etc. to avoid double work and excessive burden. Furthermore, the extensive support of a "quality team" (in levels varying for different assessment categories) should be provided throughout the entire process of assessment.

As input for a quality assessment plan for the whole organisation, it is recommended to pilot the methodology to be applied. Such piloting can be the basis for the improvements of the ISPAC, setting up workflows for particular categories of assessment and estimating the resource impact.

In a wider context, the quality assessments and a quality assurance framework, in general, are conceived to integrate in an efficient way the existing demands on management, reporting and evaluation by providing input that should avoid repetitive work, contribute to minimizing burden for production teams/ units and allow profiting from synergies of other horizontal activities in the specific organisation.

ANNEX 2. Quality and Performance Indicators

Identification and Name	Brief Description
Relevance	
R1. Rate of available statistics.	The ratio of the number of output data elements provided in accordance with a relevant ESS regulation to those required by the regulation.
Accuracy	
A1. Coefficient of variation (CV).	The standard error of the estimator divided by the expected value of the estimator.
A2. Rate of overcoverage.	The proportion of units accessible via the frame that do not belong to the target population.
A3. Edit failure rate.	The proportion of responding units for which an error signal is triggered by a specified checking algorithm.
A4. Unit response rate.	The ratio of the number of units for which data for at least some variables have been collected to the total number of units designated for data collection.
A5. Item response rate.	The ratio of the number of units which have provided data for a given variable to the total number of designated units.
A6. Imputation rate.	**The ratio of the number of assigned values (data are missing, invalid or inconsistent or have failed edits) for a given variable to the total number of values.**
A7. Number of mistakes made, by type.	The number of serious mistakes in calculation or presentation of aggregates that are not found until after publication.
A8. Average size of revisions.	The average over a time period of the difference between a later and an earlier estimate expressed as the average revision, the average absolute revision, and/or the corresponding relative quantity(ies).
Timeliness and Punctuality	
T1. Time lag between end of reference period and date of first/ provisional results.	The number of days from the last day of the reference period to the day of publication of first results.
T2. Time lag between the end of reference period and date of final results.	The number of days from the last day of the reference period to the day of publication of final results.
T3. Punctuality of publication.	The number of days separating a previously announced date of publication and the actual date.

Identification and Name	Brief Description
Accessibility and Clarity	
AC1. Number of subscriptions/ purchases of each of the key paper reports.	As stated.
AC2. Number of accesses to on-line databases.	As stated (to be further defined in collaboration with an IT expert).
AC3. Rate of completeness of metadata	The ratio of the number of metadata elements provided to the total number metadata elements applicable.
Coherence and Comparability	
CC1. Lengths of comparable time series.	Number of reference periods in time series from last break.
CC2. Asymmetries for statistics mirror flows.	Discrepancies between data related to flows, e.g. for pairs of countries.
Assessment of User Needs and Perceptions	
US1. User satisfaction index.	The degree of satisfaction with services and products for different segments of users.
US2. Length of time since most recent user satisfaction survey.	As stated.
Performance Cost and Respondent Burden	
PCR1. Annual operational cost, with breakdown by major cost components.	Direct costs of staff involved in data collection (questionnaires, distribution, capture), reducing non-response, processing, and compilation of estimates.
PCR2. Annual respondent burden in hours and/or financial terms	Respondent burden in hours is defined as number of respondents/questionnaires * average time per respondent, summed over all repetitions of statistical process within a year. Respondent burden in financial terms is defined as respondent burden in hours * average hourly cost to respondents.