QUALITY GUIDELINES

FOR THE STATISTICAL PROCESSES

BY GSBPM PHASES 1 – 8

Quality review
Quality management

INSTAT

Version 2.0

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Contents

Abbreviations

INSTAT – Institute of Statistics
ESCP – European Statistics Code of Practice
GSBPM – Generic Statistical Business Process Model
ITC – Information technology Communications
TQM – Total Quality Management
IMS- INSTAT Metadata System
ESMS – European Standards Metadata System
ESQRS - European Standards Quality Reference System
EUROSTAT – European Statistical Office (Directorate-General of the European Commission located in Luxembourg)
UNECE - United Nations Economic Commission for Europe
OECD - Organization for Economic Co-operation and Development
ILO – International Labour Organization
PAPI- Paper Assisted Paper Interview
CAPI- Computer Assisted Paper Interview
CATI-Computer Assisted Telephone Interview
SDC – Statistical Disclosure Control
SDMX – Statistical Data and Metadata eXchange

INSTAT OBJECTIVES, MISSION, VISION

The mission of INSTAT is to produce neutral, transparent and up to date statistics that help users in the process of development and transformation in the economic and social spheres within the country. INSTAT, as the main institution of producing official statistics and coordinator of the national statistical system, aims to provide reliable and comparable data, adapting methodologies and adding a list of statistical indicators. The ultimate goal of statistical data production process linked to the core activity of the INSTAT is the development, production and dissemination of outputs, i.e. statistical information (e.g. data, tables, data files, charts, analyses and account systems).

The main challenges of INSTAT for achieving strategic objectives and successful implementation of statistical activities as a whole are foreseen to be:
1. Culture of Change and Development: INSTAT should use communication and motivation instruments to employees in order to increase awareness of development and innovation.
2. Efficient policies and strategies: INSTAT should build standards by applying regulations, guidelines, manuals, and other formal incentives to guide the institution towards achieving strategic objectives.
3. Institutional and organizational level: INSTAT should work to build adequate management systems, vertical and horizontal interaction among sectors to achieve short, medium and long term goals by using the resources available to the institution in the most accessible way.
4. Communicating with the users: Users of official statistics are clients of products provided by INSTAT. The institution should work to increasingly align the users' expectations and satisfaction with official statistics, strictly respecting statistical principles and international standards.

INSTAT strategic objectives are as follows:
Objective 1: Timely and quality output and distribution of statistical data in the economic, social, demographic and environmental fields at the central and local level.
Objective 2: Use of appropriate data sources and instruments to improve the production and quality of indicators and statistical services.
Objective 3: Professional and organizational improvement of the National Statistical System.
Objective 4: Development of innovative ITC systems for statistical processing, data exchange and communication.
One of the main strategic objectives is to improve the production and quality of indicators and statistical services. We can provide high quality outputs if we realize our processes by taking into account quality guidelines. According to it, besides assessing product quality, we continuously improve quality, cost effectiveness and productivity by taking into consideration quality from planning and goal setting to dissemination. If any process is carried out at an insufficient level, that compromises the quality of the published statistical data. In order to carry out INSTAT's core activity in a quality manner, expectations should be clear to all, i.e. ***quality guidelines*** are needed.

The objective of this document is to set up general expectations and recommendations in connection with statistical process and sub-process phases for managers and employees (both experienced and new hire) of INSTAT as well as people responsible for the process phases. All of these are important in order to ensure that procedures and ultimately outputs are of the best possible quality. Another objective is to offer information to users of INSTAT data on the best practices adopted during data generation. Quality statistics takes into account the principles of the European Statistics Code of Practice (see Table 1).

EXTERNAL EXPERTISE

This document uses the results of the expertise accumulated by INSTAT, Commitment to quality; Strategy of Total Quality Management; GSBPM v.5 .1Guidelines; Quality Indicators for the Generic Statistical Business Process Model (GSBPM) for Statistics derived from Surveys and Administrative Data Sources. When compiling the guidelines, we relied on a number of international guidelines and requirements. It relies on the quality guidelines of international statistical institutes with a proven track record and excellent results of quality management (e.g. Statistics Canada, Statistics Finland, the US Federal Statistical Agencies, UK Office for National Statistics, Hungarian Statistical Office and the Italian National Institute of Statistics) and on the Code of Practice revised in November 2017 by the EU Statistical Programed Committee (Table 1).

Tab.1 Principles of European Statistics Code of Practice

Institutional environment
PRINCIPLE 1 Professional Independence
PRINCIPLE 1bis Coordination and cooperation
PRINCIPLE 2 Mandate for Data Collection and Access to Data
PRINCIPLE 3 Adequacy of Resources
PRINCIPLE 4 Commitment to Quality
PRINCIPLE 5 Statistical Confidentiality and Data Protection
PRINCIPLE 6 Impartiality and Objectivity
Statistical Processes
PRINCIPLE 7 Sound Methodology
PRINCIPLE 8 Appropriate Statistical Procedures
PRINCIPLE 9 Non-excessive Burden on Respondents
PRINCIPLE 10 Cost Effectiveness
Statistical Output
PRINCIPLE 11 Relevance
PRINCIPLE 12 Accuracy and Reliability
PRINCIPLE 13 Timeliness and Punctuality
PRINCIPLE 14 Coherence and Comparability
PRINCIPLE 15 Accessibility and Clarity

LINKS TO THE ESCP PRINCIPLES COMPLIANT WITH QUALITY

Table 1 reveals that a separate bloc of the Code of Practice (principles 7 to 10) offers recommendations specifically for statistical processes. Overall, the quality guidelines for statistical processes serve as compliance with principles 4, 7, 8, 9 and 10 and their indicators (for the details see Table 2), a fact that we took into account, either directly or indirectly, in laying down the quality guidelines. Conscious process management – also an aim of the quality guidelines – exerts its ultimate impact on the quality components of statistical outputs (principles 11 to 15).

http://ec.europa.eu/eurostat/web/quality/european-statistics-code-of-practice/november 2017;

Table 2 Principles of ESCP compliant with quality

Principles	***Description***	***Indicators***
Principle 4: Quality Commitment	Statistical authorities must produce and disseminate European Statistics respecting scientific independence and in an objective, professional and transparent manner in which all users are treated equitably.	Statistics are compiled on an objective basis determined by statistical considerations.
		Choices of sources and statistical techniques are informed by statistical considerations.
		Errors discovered in published Statistics are corrected at the earliest possible date and publicized.
		Information on the methods and procedures used by the statistical authority are publicly available.
		Statistical release dates and times are pre-announced.
		All users have equal access to statistical releases at the same time and any privileged pre-release access to any outside user is limited, controlled and publicized. In the event that leaks occur, pre-release arrangements should be revised so as to ensure impartiality.
		Statistical releases and statements made in Press Conferences are objective and nonpartisan.
Principle 7: Sound Methodology	Sound methodology must underpin quality statistics. This requires adequate tools, procedures and expertise.	The overall methodological framework of the statistical authority follows European and other international standards, guidelines, and good practices.
		Procedures are in place to ensure that standard concepts, definitions and classifications are consistently applied throughout the statistical authority.
		The business register and the frame for population surveys are regularly evaluated and adjusted if necessary in order to ensure high quality.
		Detailed concordance exists between national classifications and vectorization systems and the corresponding European systems.
		Graduates in the relevant academic disciplines are recruited.
		Staff attend international relevant training courses and Conferences, and liaise with statistician colleagues at international level in order to learn from the best and to improve their expertise.
		Co-operation with the scientific community to improve methodology is organized and external reviews assess the quality and effectiveness of the methods implemented and promote better tools, when feasible.
Principle 8: Appropriate Statistical Procedures	Appropriate statistical procedures, implemented from data collection to data validation, must underpin quality	Where European Statistics are based on administrative data, the definitions and concepts used for the administrative purpose must be a good approximation to those required for statistical purposes.
		In case of statistical surveys, questionnaires are systematically tested prior to the data collection.

	statistics.	Survey designs, SAMPLE selections, and SAMPLE weights are well based and regularly reviewed, revised or updated as required.
		Field operations, data entry, and coding are routinely monitored and revised as required.
		Appropriate editing and imputation computer systems are used and regularly reviewed, revised or updated as required.
		Revisions follow standard, well-established and transparent procedures.
Principle 9: Non-Excessive Burden on Respondents	The reporting burden should be proportionate to the needs of the users and should not be excessive for respondents. The statistical authority monitors the response burden and sets targets for its reduction over time.	The range and detail of European Statistics demands is limited to what is absolutely necessary.
		The reporting burden is spread as widely as possible over Survey populations through appropriate sampling techniques.
		The information sought from businesses is, as far as possible, readily available from their accounts and electronic means are used where possible to facilitate its return.
		Best estimates and approximations are accepted when exact details are not readily available.
		Administrative sources are used whenever possible to avoid duplicating requests for information.
		Data sharing within statistical authorities is generalised in order to avoid multiplication of surveys.
Principle 10: Cost Effectiveness	Resources must be effectively used.	Internal and independent external measures monitor the statistical authority's use of resources.
		Routine clerical operations (e.g. data capture, coding, and validation) are automated to the extent possible.
		The productivity potential of information and communications technology is being optimized for data collection, processing and dissemination.
		Proactive efforts are being made to improve the statistical potential of Administrative records and avoid costly direct surveys.

TOTAL QUALITY MANAGEMENT – TQM

In order to establish the highest quality level, INSTAT has set up a management model in accordance with the Total Quality Management – TQM principles. This is a comprehensive document about the TQM that deals with quality throughout the entire INSTAT organizational structure.
The basis for preparing the total quality management strategy is the definition of the five principles within the framework of which INSTAT develops the field of quality. Principles and main goals of INSTAT according to TQM are as follows:

1. Good quality of statistical processes and products
2. Satisfied users with official statistics
3. Reduce the burden of respondents
4. Improve effectiveness of statistical processes
5. Training and knowledge management

The INSTAT uses the standard documentation prepared in accordance with the Eurostat recommendations.
Further on the document are presents each of the five principles with objectives which follow the principles of the European Statistics Code of Practice. Each objective is composed of:

- Indicators important for monitoring the implementation of the objective
- Activities that will be necessary for implementing the objective.

SET UP METADATA MANAGEMENT SYSTEM

To accomplish statistical metadata INSTAT needs to work with two different types of metadata: ***Structural metadata*** are used to define the data structures. Variable names, classifications, standard code lists, variable types, data set definitions are part of structural metadata (Harmonizing concepts, classifications and variables, promoting comparability of information). INSTAT has developed MetaPlus system for production of Structural Metadata which is already in place.

Reference metadata describe the content and quality of statistical data, data collection and processing methods.
INSTAT has developed a separate INSTAT metadata system (IMS) in which to hold the SIMS-based metadata, and so to:

- to hold its SIMS data in both the Albanian and English languages
- to link with the Eurostat Metadata Handler
- to link with the INSTAT website
- to link with the narrative Quality Reports that are in ESQRS format

Having it in Albanian language can enable the metadata to be made available to users in Albania, while having it in English language can enable INSTAT to meet its obligations to provide its metadata in English in ESMS and ESQRS formats to Eurostat. INSTAT see the development of an IMS as essential in achieving these aims of meeting the need of Eurostat and Albanian users in a consistent and efficient manner.
For the referential Metadata the SIMS version 2.0 is implemented as a standard. A separate system is developed for the referential metadata, which will be used to produce the metadata and quality reports (ESMS and ESQRS) in Albanian and English. For a part of the statistical activities ESMS and/or ESQRS have been created and published in INSTAT website.

INTRODUCTION

Quality Guidelines oriented by GSBPM

INSTAT is committed to ensure the highest quality with respect to the compilation of statistical information. In accordance with the Law on Statistics, No 17/2018, INSTAT use statistical methods and processes in compliance with internationally recognized scientific principles and standards, conduct on going analyses of the statistics with view to quality improvements and ensure that statistics are up to date. The aim is to provide statistical products and services that correspond to the statistical information needs of different user.

In performing this task it follows the general principles of quality management from the European Statistics Code of Practice.

As only used statistics are useful statistics, INSTAT strives to become the major source of statistical information providing decisions makers, research and education in Albania as well as in the international community with relevant, reliable and comparable statistical information. With a learning attitude and systematic network for marketing and disseminating, statistical information makes use of modern networking structures and information technology.

INSTAT takes into account the following principles: impartiality, quality of processes and products, user orientation, employee orientation, effectiveness of statistical processes, reducing the workload for respondents. The challenge is to provide official statistics in good quality and efficiently with lowest possible costs.

The application of a standard for statistical production is one of the main recommendations of Eurostat to be implemented by the National Statistical System. The GSBPM (GSBPM) model describes and defines a community under the processes needed to produce official statistics. It provides a standard structure and a harmonized terminology to help statistical producers modernize statistical production processes and share methods and components. This model serves to describe the production of statistics in a more general and process-oriented manner. It is used internally and between statistical offices as a common working ground for producing statistics in a variety of ways, such as quality, efficiency, standardization and process orientation.
The GSBPM model can also be used to integrate metadata data and standards as a documentation model to harmonize statistical calculation infrastructure and provide a structure for the quality evaluation and improvement process. Documentation of process production is a basic element for each statistical institute. It is essential to recognize and document production methods. It is necessary to have a common format for describing and analyzing each part of the process by identifying best practices, seeing deficiencies in tools, and taking measures to reduce risks in the future.

This allows comparison of the production method between the statistical processes within INSTAT, but at the same time with other producers of the National Statistical System and the European Statistical System, always trying to improve efficiency.

The GSBPM model is a consolidated international standard and tailored too many statistical offices and international bodies that suggest the structure of the production process and sub-processes of the statistics production model. For this purpose INSTAT has adapt the GSBPM version 5.1 as a reference classification in order to outline the production pattern of each statistical process.

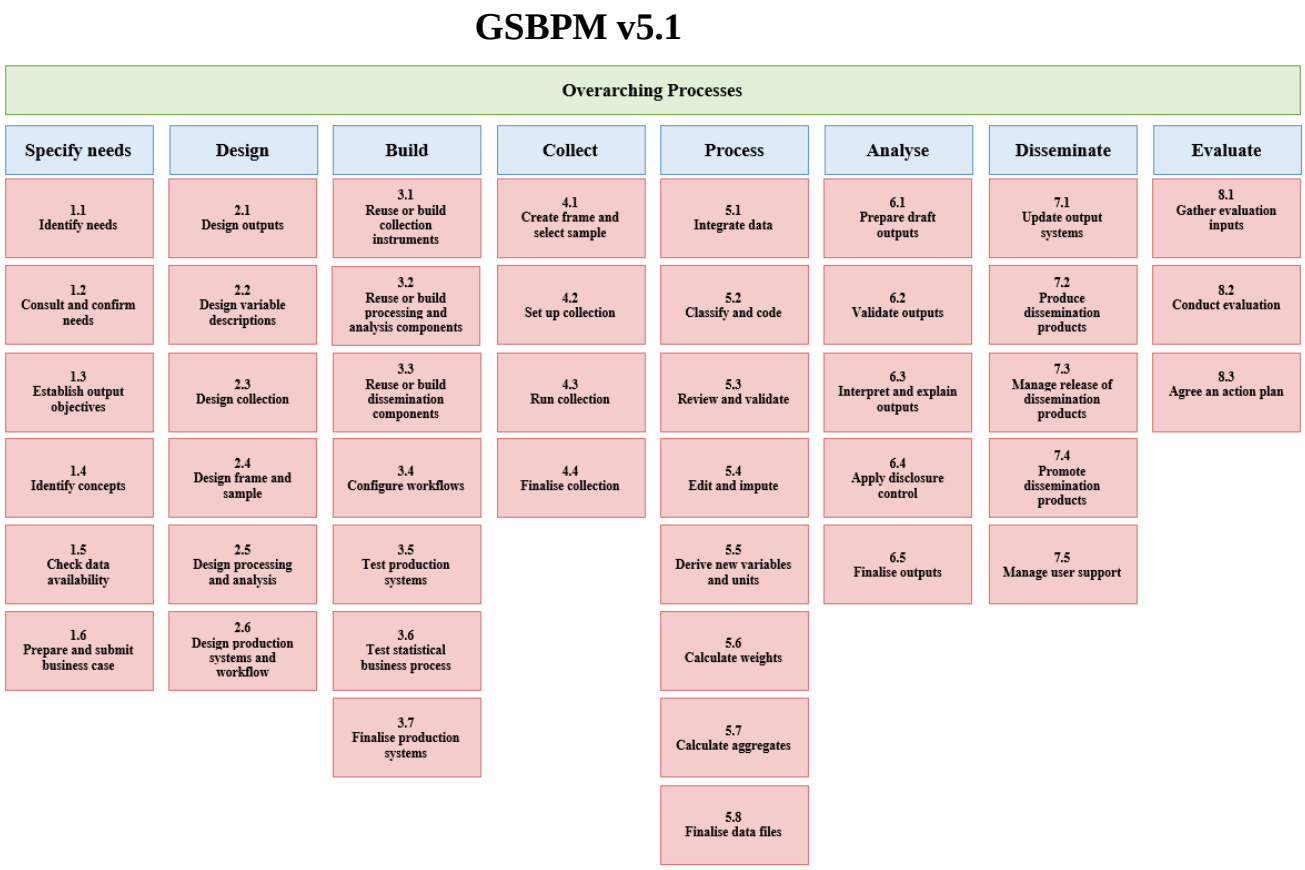
The GSBPM model has been approved by UNECE, Eurostat and the OECD in the METIS work meeting in 2009. This structure includes 8 basic processes and 44 sub processes.

The GSBPM model is a reference point for statistical applications as well as data management. The GSBPM comprises three levels:
Level 0, the statistical business process;
Level 1, the eight phases of the statistical business process;
Level 2, the sub-processes within each phase.

The eight stages of Level 1 are:
1. Specify needs;
2. Design;

3. Build;
4. Collect;
5. Process;
6. Analyze;
7. Disseminate;
8. Evaluate.

Phases 1-3 can be qualified as preparers, stages 4-7 correspond to production and phase 8 summarizes and formulates an action plan.



The GSBPM also recognizes several over-arching processes that apply throughout the eight phases, and across statistical business processes. These can be grouped into two categories, those that have a statistical component, and those that are more general, and could apply to any sort of organization. The first groups are considered to be more important in the context of this model; however the second group should also be recognized as they have (often indirect) impacts on several parts of the model.

The GSBPM recognises several overarching processes with a strong statistical component that apply throughout the eight phases. These overarching processes included the list below. Quality management, metadata management and data management are elaborated further in Section “Over-Arching Processes”.

Quality management - This process includes quality assessment and control mechanisms. It recognises the importance of evaluation and feedback throughout the statistical business process;

Metadata management - Metadata are created/reused and processed within each phase, there is, therefore, a strong requirement for a metadata management system to ensure the appropriate metadata retain their links with data throughout the GSBPM. This includes process-independent considerations

such as metadata custodianship and ownership, quality, archiving rules, preservation, retention and disposal;

Data management - This includes process-independent considerations such as general data security, custodianship and ownership, data quality, archiving rules, preservation, retention and disposal;

Process data management - This includes activities of registering, systematising and using data about the implementation of the statistical business process. Process data can aid in detecting and understanding patterns in the data collected, as well as in evaluating the execution of the statistical business process as such;

Knowledge management - This ensures that statistical business processes are repeatable, mainly through the maintenance of process documentation;

Provider management - This includes cross-process burden management, as well as topics such as profiling and management of contact information (and thus has particularly close links with statistical business processes that maintain registers).

More general over-arching processes include:

- Human resource management;
- Financial management;
- Project management;
- Legal framework management;
- Organizational framework management;
- Strategic planning

Applicability

The GSBPM is intended to apply to all activities undertaken by INSTAT, at both the national and international levels, which result in data outputs.

The model is designed to be applicable regardless of the data source, so it can be used for the description and quality assessment of processes based on surveys, censuses, administrative registers, and other non-statistical or mixed sources.

Whilst typical statistical business processes include collecting and processing data to produce statistical outputs, the GSBPM also applies when existing data are revised, or time-series are re-calculated, either as a result of improved source data or a change in methodology. In these cases, the input data can be original microdata and/or additional data, which are then processed and analysed to produce revised outputs. In such cases, it is likely that several sub-processes and possibly some phases (particularly the early ones) would be omitted. Similarly, the GSBPM can be applied to processes such as the compilation of national accounts and the typical processes in international statistical organisations that use secondary data from countries or other organisations.

As well as being applicable for processes which result in statistics, the GSBPM can also be applied to the development and maintenance of statistical registers, where the inputs are similar to those for statistical production (though typically with a greater focus on administrative data), and the outputs are typically frames or other data extractions, which are then used as inputs to other processes.

The GSBPM is sufficiently flexible to apply in all of the above scenarios.

Using the GSBPM

The GSBPM is a reference model. It is intended that GSBPM is used by INSTAT to different degrees. An organisation may choose to either implement the GSBPM directly or use it as the basis for developing customised version of the model. It may be used in some cases only as a model to which organisations refer when communicating internally or with other organisations to clarify discussion. The various scenarios for the use of the GSBPM are all valid. In 2017th INSTAT choose to implement GSBPM for monitoring the timeline of all statistical processes, while in 2018th to use it directly for describing and documenting statistical processes.

When organisations have developed organisation-specific adaptions of the GSBPM, they may make some specialisations to the model to fit their organisational context. The evidence so far suggests that these specialisations are not sufficiently generic to be included in the GSBPM itself.

In some cases, it may be appropriate to group some of the elements of the model. For example, initial three phases could be considered to correspond to a single planning phase. In other cases, particularly for practical implementations, there may be a need to add one or more detailed levels to the structure to separately identify different components of the sub-processes.

There may also be a requirement for a formal sign-off between phases, where the output from one phase is certified as suitable as input for the next. This formal approval is implicit in the model (except in the sub-process 1.6) but may be explicitly implemented in different ways depending on organisational requirements. A statistical survey includes all activities of collecting, processing and disseminating statistical data. Through the years the practice of INSTAT has created different types of statistical surveys. The input data collection method creates differences between different types of statistical sources:

- Censuses: Data is collected for all target population units.
- Surveys: Data is collected for a randomly selected sample of target population units.
- Administrative Resources: Data that was originally collected for any other purpose and is used by INSTAT for the production of statistical indicators.

QUALITY GUIDELINES

The purpose of this document is the description and guidance for the proper implementation of the description of the statistical processes carried out by INSTAT. This document it is being used for actual statistical activities that are planned to be implemented and it will be used in the future as well. The first version of this document has been drafted and started to be used from 2018. GSBPM is implemented and interpreted in the most appropriate manner.

A statistical business process is a collection of related and structured activities and tasks to convert input data into statistical information. In the context of the GSBPM, organisations or groups of organisations perform statistical business processes to create official statistics to satisfy the needs of the users. The output of the process may be a mixed set of physical or digital products presenting data and metadata in different ways, such as publications, maps, electronic services, among others.

The GSBPM should be applied and interpreted flexibly. It is not a rigid framework in which all steps must be followed in a strict order, instead it identifies the possible steps in the statistical business process and the inter-dependencies between them.

Although the presentation of the GSBPM follows the logical sequence of steps in most statistical business processes, the elements of the model may occur in different orders in different circumstances. Also, some sub-processes will be revisited, forming iterative loops, particularly within the Process and Analyse phases.

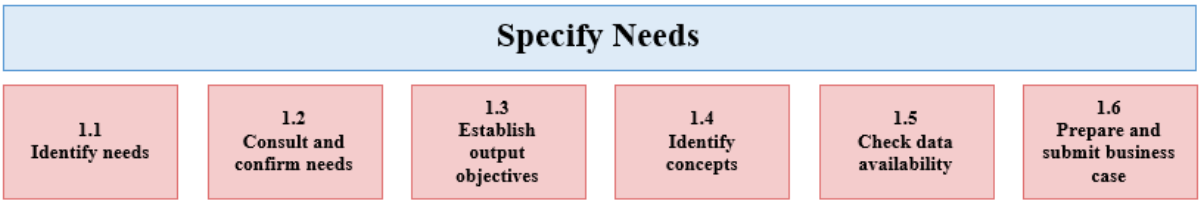
The GSBPM can be viewed as a checklist to make sure that all necessary steps have been considered or as a "cookbook" to identify all the "ingredients" of a statistical business process.

In many statistical organisations, the first few phases are only considered when a new output is created or when the process is revised as a result of an evaluation process. Once the output becomes part of “normal” ongoing activity, these phases are not undertaken (for example, it is not necessary to build new collection tools every time labour force survey data are collected).

The GSBPM should therefore be seen more as a matrix, through which there are many possible paths. In this way, the GSBPM aims to be sufficiently generic to be widely applicable and to encourage a standard view of the statistical business process, without becoming either too restrictive or too abstract and theoretical.

This section considers each phase in turn, identifying the various sub-processes within that phase and describing their content.

1. Specify needs phase



This phase is triggered when a need for new statistics is identified or feedback about current statistics initiates a review. It includes all activities associated with engaging stakeholders to identify their detailed statistical needs (current or future), proposing high level solution options and preparing a business case to meet these needs.
The "Specify Needs" phase is broken down into six sub-processes (schema above) which are generally sequential, from left to right, but can also occur in parallel, and can be iterative. These sub-processes are:

1.1 Identify needs

This sub-process includes the initial investigation and identification of what statistics are needed and what is needed of the statistics. It may be triggered by a new information request or an environmental change such as a reduced budget. Action plans from evaluations of previous iterations of the process or from other processes might provide an input to this sub-process. It also includes consideration of practice amongst other (national and international) statistical organisations producing similar data and the methods used by those organisations.

Specification of data needs starts when data does not exist or when existing data does not fully meet the needs of all users for data, or based on new requests or collaboration agreements. Data needs arise from different users: governmental institutions, the Bank of Albania, national and international institutions, as well as the professional or general public. In the framework of preparation, different methods should be studied so that statistical activity meets all the required needs. In this sub-process, financial and material resources for the implementation of tasks can be planned. Accurate and timely planning is of key importance for effective implementation and efficiency.
This stage is updated or supplemented when there is a need for new statistics or changes related to current statistics produced by INSTAT. It determines whether there is a presently incomplete application, either domestically or internally (e.g. from domestic institutions or Eurostat) and can be produced by INSTAT.

Quality guidelines

In order to map the statistical needs, the user groups of the specific statistics already available must be identified.

The first step towards identifying information needs is to identify the user groups of the specific statistics already available. To this end, users should be classified according to the importance of their needs based on which key or high profile user groups can be identified.
A likely basis for such grouping is the importance of the usage of the specific statistics concerned (e.g. statistics for the preparation of government decisions).
When analyzing users, it is important that special attention should be paid to the information needs of the key users of the statistics already available, i.e. the information needs of this group of users and any change in them must be reviewed.

Efforts should be made at establishing continuous co-operation with users and participants.

In order to identify needs and to monitor new needs continuously, it is important that partnership should be forged with users. To this end, it is important that a broad-based relationship should be maintained with users of specific statistics in the private and the public sector, the academia and the public at large, which can also be viewed as part of the office's product and service marketing activity.

Needs for statistical activities in progress should be reviewed at regular intervals.

In addition to needs assessment, a review of statistical activities in progress is another important component of mapping information needs. The underlying reason for this is that these statistical projects should also be implemented in conformity with user needs. Therefore, it is inevitable that they be reviewed from this perspective. If specific statistics are no longer produced in conformity with current needs, they must be developed, revised or upgraded.

***A useful tool for needs assessment is a repeated analysis of needs that could not be satisfied earlier and of the feedback from users* subsequent to earlier data recording.**

Information needs can be identified indirectly, on the basis of information already available. One such indirect method is a review, from a feasibility perspective, of the needs received earlier that could not be satisfied when they arose.
This also includes a review of the results of user satisfaction surveys that asked users about the usability of the generated statistics in question subsequent to earlier data collections.

Information needs should be analyzed from a feasibility perspective and it should be checked whether there are specific statistics or data sources suitable for satisfying needs.

When needs for information arise, the first thing to check is whether there are specific statistics either available already or in progress or any other sources, e.g. administrative data, that can satisfy information needs.
If no such statistics are available, the components of the specific statistics to be generated in response to the needs concerned and the extent to which these can be measured should be identified.

Quality dimension

- ✓ Relevance

Possible quality indicators

- ✓ CF1. Rate of unsatisfied user needs

1.2 Consult and confirm needs

This sub-process focuses on consulting with the internal and external stakeholders and confirming in detail the needs for the statistics. A good understanding of user needs is required so that the statistical organisation knows not only what it is expected to deliver, but also when, how, and, perhaps most importantly, why. For the second and subsequent iterations of this phase, the main focus will be on determining whether previously identified needs have changed. This detailed understanding of user needs is the critical part of this sub-process.

The main focus will be on determining whether the needs identified by INSTAT for any statistical activity have changed. In this sub process are confirmed financial and material resources for the implementation of tasks.

Quality guidelines

Extensive close focus group consultations should be held with users.

This is the first step immediately following the identification of needs for information that explores the details of needs. For this reason, we need to hold discussions with the users communicating their needs to us. In the course of the discussions we can identify content criteria, user purposes and the reasons why the need for data has arisen in detail; furthermore, we can win support for data recording. Only trust can validate the relevant accurate statistics. Therefore, an open mind and the right attitude are vital during consultations.
Furthermore, consultations are also likely to shed light on prospective users' proposals for solutions as well as the timeline for the future transfer of information.

Subsequent to discussions, the content components of the individual needs will have to be prioritized.

Content components need to be prioritized according to their importance and feasibility (and aligned with the hierarchy of users). This includes an analysis of the relevant legal background that pertains to the measurability of the individual content components.

During the consultations the prioritization needs and their content components have to be aligned with costs, respondent burden and data protection criteria.

A major element of measurability and feasibility is the analysis of costs, expected respondent burden arising from data collection and prospective data protection issues. If needs or their components place too much burden on respondents or the difficulty of measurability is obvious already in this phase (envisaged low willingness on the part of respondents in respect of the given issues), prospective users need to be informed on such. The same must be done if data protection issues arise already in this phase.

When analyzing needs, before approval, it is important that efforts should be made at finding the most cost efficient solutions possible in both the long and the short run.

This also holds true for content components because there may be some that are already available in existing accessible data. Therefore, available accessible data and user needs should be compared and a timeframe and a budget for new data recording must be assessed.

In the event that there are conflicting needs or content components, efforts should be made to resolve such conflicts.

A series of consultations need to be held. During the consultations, where the INSAT acts as a moderator, efforts should be made to arrive at a consensus in the case of conflicting needs. Discussions should, therefore, result in needs specifications that sum up various content aspects and suit all users.

In connection with this, the needs that are not used in practice can also be assessed.
If there are express target expectations for data quality, they should be included in the measurable quality criteria of research objectives.

Needs and research objectives can be classified according to quality components (e.g. accuracy and timeliness).

When discussing, agreeing on and approving needs, it is important that attention should be paid to the objectives of the secondary use of statistical data or those of statistical framework systems (e.g. national accounts).

When information needs and content components are grouped and prioritized, special attention should be paid to the impact that the approval of the needs may exert on the secondary use of the data thus generated.

Quality dimension

- ✓ Relevance

Possible quality indicators

- ✓ Identification of methods to assess user needs
- ✓ (R1) Customer satisfaction index

1.3 Establish output objectives

This sub-process identifies the statistical output objectives that are required to meet the user needs identified in sub-process 1.2 (Consult and confirm needs). It includes agreeing the suitability of the proposed outputs and their quality measures with users. Legal frameworks (e.g. relating to confidentiality), and available resources are likely to be constraints when establishing output objectives.

Quality guidelines

Users must be involved in identifying the envisaged forms of data disclosure and a time table for publications for each output type.

Planning should include the contemplated disclosure of preliminary and final data, tabulated data, analyses and micro-data files.

Agreement should be reached on the publication of flash and preliminary estimates before the disclosure of final data.

Efforts should be made to provide easy access to data (electronically or on the Internet) for users and to ensure that, if the need arises, data are also suitable for further use.

Aggregate breakdowns (e.g. by area) to be disclosed on the basis of data surveys must be discussed and agreed on with users.

During the disclosure of preliminary data various methods (sample-based and model-based assessments, etc.) lead to various degrees of accuracy. Users must be consulted on the envisaged accuracy and timing of preliminary data.

- In order to efficiently create the sampling design, familiarity with the breakdowns requested by users is indispensable.
- Possible sampling errors can be estimated on this basis.

When quality criteria are discussed, the probable non-response rate should be pointed out.

Non-response rates can be estimated on the basis of non-response rates experienced earlier during similar surveys and international experience.
If the planned survey is used for publication on more than one topic, a priority of topics should be set up.

In case of extensive surveys, data on several topics can be disclosed. The availability of an order of publications helps optimize processing.

The various forms of publication, information facilitating clarity and pricing must be discussed and agreed upon with users.

During the discussions both channels for accessing data and the content and depth of the metadata attached to the data must be pointed out.

Quality Dimension

- ✓ Statistical Confidentiality and security
- ✓ Relevance
- ✓ Accuracy and reliability
- ✓ Adequacy of resources

Possible quality indicators

- ✓ Includes extreme value checks, population unit checks, variable checks, combinations of variables checks, etc.

1.4 Identify concepts

This sub-process clarifies the required concepts to be measured from the point of view of the users. At this stage, the concepts identified might not align with existing statistical standards. This alignment, and the choice or definition of the statistical and other concepts and variables to be used, takes place in sub-process 2.2 (Design variable descriptions).

Quality guidelines

The terms and concepts that follow from user needs must be clearly identified and defined.

If conclusions are to be drawn from the data generated as a result of a survey, it is highly important that concepts (terms) and the object of the survey concerned be clearly defined and identified respectively. ***Available standard terms and concepts should be used only for purposes identified in those standards.***

As statistical data need to be grouped on the basis of some criteria in order that an analysis for information can be conducted, such criteria should be aligned with the purpose of the analysis. The Metaplus system governs terms and concepts.

Efforts must be made to use the concepts (terms) adopted internationally in the given specialist area.

Concepts (terms) must be clearly documented, and any deviation from standards or from those used for the generation of the relevant data should be pointed out.

In the absence of official standards or in the case of different needs, the related Albanian regulations must be examined.

If a substitute concept is used, such must be documented and explained.

In the absence of standards and a legal basis, professional considerations must come to the fore.
In the absence of standards and a legal basis, experts and trade organizations should be involved in formulating the necessary set of concepts.

Links between the individual concepts must be clearly indicated.

In order to interpret concepts easily, it is important that links with other concepts (e.g. in a narrower sense, in a broader sense and synonymous, etc.) be pointed out already during the planning phase

A concept or definition selected at a given point of time may become obsolete; therefore, it will have to be updated.

It is important that changes in concepts be documented. Historical aspects should also be asserted during updating.

Close attention must be paid to concepts (terms) applied during the secondary use of statistical data or the compilation of statistical framework systems (e.g. the system of the national accounts), for they may exert significant impact on the individual data collections.

Further factors, e.g. the difficulty of obtaining the necessary information, the burden imposed on respondents, the method of data collection, the context of questions, the methods of processing and the definitions applicable to the administrative sources to be used, must also be taken into account when concepts are selected.

We map related and existing statistical concepts (terms) including international standards as well as the concepts (terms) in current statistics.

After identifying concept content, we map similar related statistical concepts (terms). This helps decide whether new statistical concepts must be formulated or existing ones must be modified in order for the needs to be satisfied.

In order to reduce respondent burden, secondary data sources related to the given theme must be identified so that we can map the concepts used by them.

Concept deviations must be documented when secondary (e.g. administrative) data sources are used for statistical purposes. Differences in the purposes of use may lead to concept deviations.

Aligned concepts and their definitions help users and integrate compare data; however, substitute definitions may have to be used due to differences in needs (objectives).

The use of standard definitions helps compare and integrate data from various sources. Internationally accepted standard concepts also used in the EU, the UN and other international organizations must be used at the INSTAT.

Documentation and accessibility are especially important for users who wish to use data for e.g. further calculations and analyses.

In order for conclusions to be drawn from data files, it is highly important that users should familiarize themselves with these terms. Along with the data disclosed, the concepts and the definitions used must also be placed at users' disposal in the methodological documentation of specific statistics.

Quality dimension

- ✓ *Relevance*

Possible quality indicators

- ✓ Ratio of defined concepts to all concepts
- ✓ Percentage of items that deviate from the target concept or international standards

- ✓ Ratio of valid concepts to all concepts
- ✓ Ratio of concepts transmitted from secondary data sources to all the concepts in specific statistics
- ✓ Degree of correspondence between concepts in secondary data sources and statistical concepts:
    - good
    - acceptable
    - unacceptable
- ✓ Metadata for ADS to determine if relevant variables are available (e.g. presence of useful combinations of variables.)
- ✓ When assessing the usability of the variables for a statistical output, we can weight this indicator for whether or not the variables are key to the statistical output

1.5 Check data availability

This sub-process checks whether current sources of data could meet user requirements and the conditions under which they would be available including any restrictions on their use. An assessment of possible alternatives would normally include research into potential administrative or other non-statistical sources of data, to:

- Determine whether they would be suitable for use for statistical purposes (e.g. the extent to which administrative concepts match data requirements, timeliness and quality of the data, security and continuity of data supply);
- Assess the division of responsibilities between data providers and the statistical organisation;
- Check necessary ICT resources (e.g. data storage, technology required to handle incoming data and data processing) as well as any formal agreements with data providers for accessing and sharing the data (e.g. formats, delivery, accompanying metadata and quality check).

When existing sources have been assessed, a strategy for filling any remaining gaps in the data requirement is prepared. This may include identifying possible partnerships with data holders. This sub-process also includes a more general assessment of the legal framework in which data would be collected and used, and may therefore identify proposals for changes to existing legislation or the introduction of a new legal framework (there may be a need for changes to the existing legislation applicable to INSTAT).

Quality guidelines

The draft proposal for data surveys to be drawn up should be simply structured, transparent, consistent and free from redundancies.

Containing considerations needed for making a decision on conducting a survey (e.g. objectives, major theoretical assumptions, use and resource requirements), a draft survey proposal in a standardized format with a simple and easy-to-follow structure should be drawn up. There should be a first concise version containing the most important information that can provide sufficient help to make a substantiated decision on whether or not to conduct a survey and whether or not it can be conducted under the given circumstances and in conformity with the given expectation.

The draft proposal should contain the fundamental information pertaining to the survey, e.g. the name of the contemplated survey, the name of organizational unit conducting the survey and a brief textual summary of the survey.

The draft proposal should contain the name of the contemplated survey, the name of organizational unit initiating and conducting the survey and a brief textual summary of the contemplated survey covering its basic criteria.
The goals of the survey must be accurately set; the persons/entities ordering and/or using the data (customers) and major users (as well as the applicable statutory regulations) and the need for commencing the survey must be indicated.

The objectives should clearly identify the hypotheses to be analyzed and data needs, with expected quality, the envisaged budget and the deadlines taken into account. The objectives should be set in a manner that makes it clear for the users what they can expect from the statistics to be generated.
When drawing up the draft proposal, it is important that the administrative data sources available for the satisfaction of data needs be identified.

When examining the possible methods of the survey, it is important that the administrative data sources available for the satisfaction of data needs be identified. If there are such data sources, a reference to this fact should be made in the plan, because this is likely to reduce the costs that may be incurred by the survey or even obviate the need for the survey.

A major component of drawing up the draft proposal is laying down the main criteria of the contemplated survey on the basis of the available current information. They are, in particular, the contemplated frequency of conducting the survey, the manner of data collection, the determination of the frame and the envisaged budget. If appropriate, alternatives should be offered.

Given the fact that a draft survey proposal is also a document used for the preparation of decisions, it should contain the main criteria for the conduct of the survey. Thus prior to the commencement of detailed planning, on the basis of the available current information, the contemplated frequency of conducting the survey and the mode of data collection (e.g. PAPI, CAPI, CATI, etc.) that can satisfy the information needs that have arisen.
The frame, the observation units and the expected number of respondents needed for the satisfaction of the needs must be identified.
Furthermore, an estimate should be provided for the envisaged budget.
The above components should be in line with the needs that have arisen.

When formulating the plan, it is important that efforts should be made to find solutions which place the least possible burden on human, physical and financial resources, but which do not compromise professional standards or quality principles. At the same time, they can satisfy the data needs of the persons and entities ordering or using the data.

When professional considerations are addressed, efforts should be made to identify available background lest financial resources be wasted and in order to place the least possible burden on respondents and the employees to be involved. When the method of data collection, the tools to be used and the techniques are selected, the size and composition of the sample are determined and number and composition of the participants are planned, we should seek to identify the optimal and most cost-efficient solutions.

The draft proposal should contain a SWOT analysis of the survey.

In this phase of planning a SWOT analysis of the survey must be carried out. The analysis consists of a list of strengths, weaknesses, opportunities and threats in respect of the whole of the survey.

Quality Dimension

- ✓ Statistical Confidentiality and security
- ✓ Relevance
- ✓ Accuracy and Reliability
- ✓ Completeness of data source(s), such as:
    - Percentage of units not belonging to the target population
    - Percentage of units missing from the target population
    - Coverage of the data
    - Absence of values for key variables
    - Missing values in the source
    - Total percentage of empty cells
- ✓ Availability of a unique key
- ✓ Cost effectiveness

Possible quality indicators

- ✓ Number of the version of the survey designs (the number of the times they had to be adjusted to the needs of users).
- ✓ The degree to which the considerations in the survey plan were satisfactory and sufficient for the decision makers (e.g. whether any additional or other information was needed)
- ✓ The extent to which the objectives of the users and the number and content of the data needed are reflected in the survey designs
- ✓ Number of the revisions of the survey design

1.6 Prepare and submit business case

This sub-process documents the findings of the other sub-processes in this phase in the form of a business case to get approval to implement the new or modified statistical business process. Such a business case would need to conform to the requirements of the approval body, but would typically include elements such as:

- A description of the "As-Is" business process (if it already exists), with information on how the current statistics are produced, highlighting any inefficiencies and issues to be addressed;
- The proposed "To-Be" solution, detailing how the statistical business process will be developed to produce the new or revised statistics;
- An assessment of costs and benefits, as well as any external constraints.

The business case describes options and makes recommendations. It may include the benefits, costs, deliverables, time frame, budget, required technical and human resources, risk assessment and impact on stakeholders for each option.

After the business case is prepared, it is submitted for approval to move to the next phase of the business process. At this sub-process, a “go”/“no go” decision is made. Typically, the business case is reviewed and formally approved or disapproved by the appropriate sponsors and governance committees.

Efforts should be done in checking the extreme value.

It includes extreme value checks, population unit checks, variable checks, combinations of variables checks, etc.

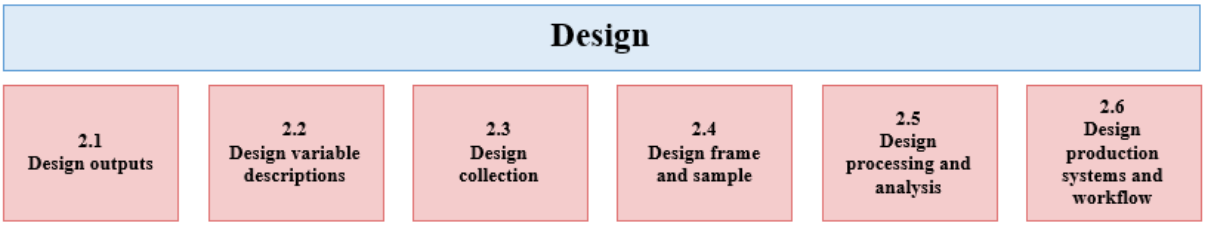
Quality Dimension

- ✓ Adequacy of resources
- ✓ Relevance

Possible quality indicators

- ✓ Includes extreme value checks, population unit checks, variable checks, combinations of variables checks, etc.

2. Design phase



This phase describes the development and design activities, and any associated practical research work needed to define the statistical outputs, concepts, methodologies, collection instruments and operational processes. It includes all the design elements needed to define or refine the statistical products or services identified in the business case. This phase specifies all relevant metadata, ready for use later in the business process, as well as quality assurance procedures. For statistical outputs produced on a regular basis, this phase usually occurs for the first iteration and whenever improvement actions are identified in the “Evaluate” phase of a previous iteration.

Design activities make substantial use of international and national standards in order to reduce the length and cost of the design process, and enhance the comparability and usability of outputs. Organisations are encouraged to reuse or adapt design elements from existing processes, and to consider geospatial aspects of data in the design to enhance the usability and value of the statistical information. Additionally, outputs of design processes may form the basis for future standards at the organisational, national or international levels.

The “Design” phase is broken down into six sub-processes (schema above), which are generally sequential, from left to right, but can also occur in parallel, and can be iterative. These sub-processes are:

2.1 Design outputs

This sub-process contains the detailed design of the statistical outputs, products and services to be produced, including the related development work and preparation of the systems and tools used in the "Disseminate" phase. Processes governing access to any confidential outputs are also designed here. Outputs should be designed to follow existing standards wherever possible, so inputs to this process may include metadata from similar or previous collections (including extractions from statistical, administrative, geospatial and other non-statistical registers and databases), international standards, and information about practices in other statistical organisations from sub-process 1.1 (Identify needs).

Outputs may also be designed in partnership with other interested bodies, particularly if they are considered to be joint outputs, or they will be disseminated by another organisation.

This stage describes the practical research work required to determine for each statistical activity the results, concepts, methodology, collection tools and operational processes. For statistical results produced on a regular basis, this phase is usually not realized, occurs only the first time the statistical activity is performed and is updated whenever corrective actions are identified at the evaluation stage.

Quality guidelines

When establishing databases, it is important that auxiliary variables and technical fields as well as the storage and the recording of the information needed for measuring quality should be borne in mind.

In the course of data generation a number of data (paradata) are automatically generated (e.g. the date of receipt, the number of corrections). They have to be stored for the future evaluation of quality, the support of processing and measuring progress in the process.
Tagging imputed values means a separate data base planning task.

When designing publication tables, graphs and maps, it is important that fundamental editing rules should be followed.

The name of the population in question should be indicated at all times.

The selection/generation of variables, indicators *and* ***classifications (II.3) also depends on the available data sources.***

Further factors, e.g. the difficulty of obtaining the necessary information, the burden imposed on respondents, the method of data collection, the context of questions, the methods of data processing and the applied definitions and classifications in the usable administrative records as well as the cost of data collection and processing, must also be taken into account when variables, indicators and classifications are selected. A definition selected at a given point of time may become obsolete, therefore, it will have to be modified or changed.

When the appropriate data source is selected, the largest possible number of data related to the phenomena or events studied have to be taken into consideration.

Subsequent to the entry of secondary data into the INSTAT's system, responsibility for the indicators derived from them lies with the INSTAT whether they stem from statistical data or administrative data. In order that a data source providing the best quality data can be selected, extensive familiarity with the topic is required. The statistical data generated outside the INSTAT, administrative data collected in public administration, the business data of major supplier and Big Data data sources must be studied both in order to be informed and for the appropriate data source can be found.

In order for a decision on the use of the data of secondary data sources to be made, data files must be evaluated and tested and the results must be documented.

The evaluation of data files must extend to the objectives, observation units, coverage, legal basis, content, concepts, definitions and classification system of the given data collection, the quality assurance adopted, the process control performed, the frequency of data and the deadlines of the data

transferred to the statistical office. Only including secondary data of appropriate quality may lead to the generation to statistical data of the expected quality.

The INSTAT relies, as much as such is reasonably possible, on available statistical or administrative data sources.

In order that duplicate data collection can be avoided and respondent burden contained INSTAT uses statistical or administrative sources already available as much as such is reasonably possible.

The INSTAT strives to participate in the design of administrative data sources.

So that administrative data can be more suitable for statistical purposes, the competent experts of the INSTAT strive to participate in the planning of new administrative registers or the registers under development. This helps the integration of statistical needs and considerations into administrative systems from the very beginning.

The INSTAT co-operates with the owners/data providers of secondary data.

In order that data quality can be guaranteed, continuous co-operation with the organizations responsible for the collection of secondary data (data transferors, data owners) should be. This relationship is particularly important at the commencement of the use of non-statistical data and the preparation of data reception. The manner of data reception, the content and format of data and the transfer of the necessary metadata must be agreed upon and, if possible, set forth in a co-operation agreement. Feedback on statistical information and the errors in data can be valuable and useful for the organization providing data because it promotes the improvement of basic data. This must be performed in a manner that complies with the data protection rules in force.

The experts responsible for the statistical use of the secondary data familiarize themselves with the process of collecting data and data management at the data provider organization.

The circumstances in which and the conditions under which data owners or data providers implemented the data collection programme must be studied. Familiarity with this allows for the possibility of identifying – from a statistical perspective of use – the strengths and weaknesses of data which must be taken into consideration during use for statistical purposes.
An appropriate method for the statistical processing programme of secondary data must be selected.

The experts responsible for the statistical use of the secondary data regularly check whether there has been any change in the applicable statutory regulations and concepts and whether this affects comparability over time.

Attention must be paid to the fact that data owners are the owners of the historical data of administrative data sources and have, at all times, full competence over them. The administrative considerations that first determined the terms and methods used in the programme may change over time, which may distort the time series derived from administrative files. Attention should be paid to such changes and their impact must be adjusted for during processing for statistical purposes.

The experts responsible for the statistical use of the secondary data lay down the expectations for the quality of data files.

In the case of the secondary use of administrative and statistical data, the quality of outputs depends directly on that of input data sources. If there are express target expectations for data quality, they should be included in the measurable quality criteria of statistical objectives.

In the case of administrative data attention should be paid to the timeliness and the reference period of the data.

Administrative sources are sometimes obsolete, no longer topical. Therefore, special attention should be paid to identifying existing (active) and ceased (no longer active) units.

The number of the advantages of using secondary data files for statistical purposes increases if the data files are connected.

Secondary data used to be collected for non-statistical purposes or for statistical purposes other than the INSTAT's, therefore they can be used only if several files are connected. Some administrative data are of longitudinal nature (e.g. income tax, product and service tax). If integrated, data files pertaining to various points of time can be used in a number of ways in statistics. If that is the case close attention must be paid to the use of identifiers because the identifiers of units may change over time.

When publishing information derived from administrative data, close attention must be paid to data protection implication.

There may arises data protection risks even if only one single administrative data source is used, and these risks may multiply if other data sources are connected to this single data source. Special care must be exercised in the case of longitudinal and personal data because their use may give rise to serious data protection issues.
The statistical organization should compile its Data Integration Regulations, which – in addition to the benefits arising from the connection of data – guarantees appropriate data protection.

When publishing information derived from administrative data, close attention must be paid to data protection implication.

Sampling may reduce the capacity required for processing administrative data.

Administrative files are often large and their use sometimes requires costly processing and takes a long time. In order to reduce costs random samples can be taken from large administrative data.

A worst-case scenario should be prepared for the eventuality that a secondary data source used earlier is temporally or persistently not available.

The use of secondary data sources often make the INSTAT vulnerable because data owners may be late in sending the requested data or fail to send them at all. It may also be the case that the data cannot be used according to their planned schedule due to their poor quality. Preparations must be made for such eventuality, and if we decide on the use of secondary data, a plan must be drawn up to replace them if necessary. A worst-case scenario should present the data sources and methods by means of which we can provide appropriate estimates temporarily.

This is especially important in the case of secondary data sources used for the calculation of indicators of strategic importance

Quality dimension

- ✓ Statistical Confidentiality and security
- ✓ Relevance
- ✓ Coherence and comparability

Possible quality indicators

- ✓ The file has arrived.
- ✓ The file arrived by the set deadline.
- ✓ The file had to be urged.
- ✓ In the case of files sent late the length of delay
- ✓ The file format is unknown.
- ✓ The file has been damaged.
- ✓ The file contains unrecognizable characters.
- ✓ No metadata have been attached to the file.
- ✓ The identifier or the reference period of the arrived secondary data is missing.
- ✓ We did not expect a file with the given identifier and reference period.
- ✓ The structure of the file departs from what has been expected.
- ✓ The number of the rows of the file/table departs from what has been expected.
- ✓ If decoding is required, subsequent to conversion, the data cannot be interpreted.
- ✓ Number and proportion of missing units
- ✓ Number and proportion of units out of the frame
- ✓ Number and proportion of the units coming up several times
- ✓ Percentage of/Extent to which outputs fulfil users' needs (and/or priority needs)
- ✓ Percentage of/ Extent to which outputs changed as a result of improvement actions or as a result of user satisfaction surveys/analyses (for outputs produced on a regular basis)
- ✓ Have the confidentiality rules and micro data access procedures been designed?
- ✓ Number and proportion of missing data
- ✓ Expected length of comparable time series.
- ✓ Number and proportion of erroneous data
- ✓ Number and proportion of units deleted or out of the frame
- ✓ Number and proportion of corrected data
- ✓ Number and proportion of accepted data tagged as erroneous
- ✓ Number and proportion of imputed units
- ✓ Number and proportion of imputed items
- ✓ Does the data supplier organization request feedback on the quality of data

2.2 Design variable descriptions

This sub-process defines the variables to be collected via the collection instrument, as well as any other variables that will be derived from them in sub-process 5.5 (Derive new variables and units), and any statistical or geospatial classifications that will be used. It is expected that existing national and international standards will be followed wherever possible. This sub-process may need to run in parallel with sub-process 2.3 (Design collection), as the definition of the variables to be collected, and the choice of collection instruments may be inter-dependent to some degree. Preparation of metadata descriptions of collected and derived variables, statistical and geospatial classification is a necessary precondition for subsequent phases.

Quality guidelines

Variables and indicators and their connections must be identified, the ones planned to be used must be revised jointly.

The statistical indicators planned to be published must be clearly defined. The variables and concepts intended to be used must be planned and defined. This also means populations, units, time and place. E.g. we publish data on the unemployed in accordance with the ILO definition, but not from the data provider; rather, we ask for information that is easy to understand and answer, and we produce the right variables compatible with the standard concept by means of a specific process. Attention must also be paid to data generation and possible linking must also be ensured by using the right concepts/variables. Temporal characteristics include examples like income in a given quarter that is income received in that quarter or income related to the performance of the given quarter that is not necessarily realized in the given quarter.

Variables and indicators must be clearly and unambiguously indicated.

If conclusions are to be drawn from a data file, it is highly important that concepts (terms) and the object of the survey concerned be clearly defined and identified respectively.

Indicators must be specific and susceptible from the perspective of the phenomenon studied.

Indicators must be able to respond to changes in the phenomenon studied fast and reliably.

Indicators must be consistent, free from variations, topical, available in a timely manner and up-to-date.

In order for indicators/variables to be interpreted, all material metadata and references must be stored and the widest possible access must be provided for users.

In addition to identifying and defining indicators, the following must also be documented: the measurement unit of the indicator, the name of the observation unit, the description of the scope and the population, the period and the date of observation, the classification criteria, the individual levels and elements of the classification system derived from their set of values, the data generation process and its connection with other indicators and variables as well as other material metadata. Interconnections between the individual concepts of public parlance and specific areas (e.g. accounting) (clarification of differences/deviations) are also important for both data collection and data reporting.

Efforts should be made to use internationally accepted standard indicators/variables and classifications.

When indicators/variables are selected, the starting point should be internationally accepted standard indicators to ensure the comparability and integration of data (e.g. social core variable).

Internationally accepted standard concepts also used in the EU, the UN and other international institutions must be used at the INSTAT. If concepts other than these are used, deviation must be documented.

Available standard indicators/variables should be used only for purposes identified in those standards.

As statistical data need to be grouped on the basis of some criteria in order that an analysis for information can be conducted, such criteria should be aligned with the purpose of the analysis. The meta information system governs terms and concepts.

In the absence of statistical standards or in the case of different needs the indicators, variables, the terms and concepts used in a specific area and administrative concepts must be studied.

If substitute indicators/variables are used, the difference between the two indicators/variables must be documented and measured.

If different nomenclatures are used and in the case of international data reporting, official conversion tables must be used.

In the interest of the comparability of data conversion tables must be generated if different nomenclatures are used and official conversion tables must be used.

Logically arranged indicators must be included in a hierarchically system of indicators.
Individual indicators are included in a system of indicators; these indicators are interconnected, complement or interpret each other and are components of information at a higher level; as a whole, there are suitable for summary, comprehensive evaluation.

Close attention must be paid to concepts (terms) and variables applied during the secondary use of statistical data or the compilation of statistical framework systems (e.g. the system* of the national *accounts), for they may exert significant impact on the individual data collections.

Further factors, e.g. the difficulty of obtaining the necessary information, the burden imposed on respondents, the method of data collection, the context of questions, the methods of processing and the definitions applicable to the administrative registers to be used, must also be taken into account when concepts, variables and indicators are selected or created.

In order to reduce respondent burden, secondary data sources related to the given theme must be identified and the concepts and variables used by them must be mapped.

Differences in concepts and variables must be documented when secondary (e.g. administrative) data sources are used for statistical purposes. Differences in the purposes of use may lead to deviations in the individual concepts.

Quality Dimension

- ✓ Cost effectiveness
- ✓ Managing metadata

Possible quality indicators

- ✓ The metadata available in addition to indicators and variables provides information on the relevance of variables.
- ✓ Accurate reference to standards
- ✓ Documenting and measuring deviations from standards
- ✓ The concepts, definitions and classifications used by the statistical office correspond to international standards; any deviation from the latter is documented and explained.

- ✓ The concepts, definitions and classifications used by the statistical office correspond to EU and national legislation and are documented.
- ✓ National classifications are aligned with the corresponding EU level classifications, conversion tables are available with supplementary explanations and justifications.
- ✓ Differences between statistical and administrative processes (concepts, definitions and coverage) are known and documented. There are procedures managing differences in place.
- ✓ Ratio of concepts transmitted from secondary data sources to all the concepts in specific statistics.
- ✓ Degree of correspondence between concepts in secondary data sources and statistical data: good – acceptable – unacceptable
- ✓ Percentage of/ Extent to which concepts, definitions and classifications associated to (key) variables and populations, are re-used from other similar surveys and ADS
- ✓ Percentage of/Extent to which concepts, definitions and classifications associated to (key) variables and populations follow international or national standards
- ✓ Percentage of/Extent to which new concepts, definitions and classifications are introduced (provide motivation for it)
- ✓ Percentage of / extent to which collected (survey and ADS) and derived variables and classifications have metadata descriptions

2.3 Design collection

This sub-process determines the most appropriate collection instruments and methods which may depend on the type of data collection (census, sample survey, or other), the collection unit type (enterprise, person, or other) and the available sources of data. The actual activities in this sub-process will vary according to the type of collection instrument required, which can include computer assisted interviewing, paper questionnaires, administrative registers (e.g. by using existing service interfaces), data transfer methods, web-scraping technologies as well as technology for geospatial data. Direct or indirect use of administrative data may be introduced in the data collection mode for either controlling survey data or assisting it when capturing survey information.

This sub-process includes the design of the collection instruments, questions and response templates (in conjunction with the variables and statistical classifications designed in sub-process 2.2 (Design variable descriptions)). It also includes the confirmation of any formal agreements. This sub-process is enabled by tools such as question libraries (to facilitate the reuse of questions and related attributes), questionnaire tools (to enable the quick and easy compilation of questions into formats suitable for cognitive testing) and agreement templates (to help standardise terms and conditions). This sub-process also includes the design of provider management systems that are specific to this business process.

Where statistical organisations do not collect data directly (i.e. a third party controls the collection and processing of the data), this sub-process may include the design of mechanisms to monitor the data and the metadata to assess impacts of any change made by the third party.

At this stage, the most appropriate collection method and instruments to be used are also defined. Current activities in this sub-process will vary according to the type of instrument that will be used for collecting the required data, which may include: PAPI, CAPI, administrative data interface, data integration techniques. It also involves the drafting of any agreement on data supply, such as memorandums of cooperation.

Quality guidelines

A detailed survey implementation plan listing the criteria of implementation must be drawn up.

If the launch of a survey is approved, a detailed implementation in a standardized format must be drawn up already containing the components of implementation like the method, the measuring tools (e.g. questionnaire), the size of samples and the cost plan of data collection, the allocation and scheduling of resources, the process of data collection and processing, publication plan and participants etc.

When a detailed survey design is made, it is important that potential users should be identified as accurately as such is reasonably possible and that consensus on survey objectives and use should be reached

It is important that the users of the data to be generated should be identified as accurately as such is reasonably possible in the planning phase and include them in the process so that information that is relevant to them can be generated during the survey. Discussions with prospective users and stakeholders (e.g. focus groups) should be held (e.g. by means of structured interviews). If this modifies initial ideas, it should be taken into account when a detailed plan is drawn up (e.g. if the target population turns out to be narrower or broader than previously planned, feasibility can be modified accordingly).

Hypotheses providing a frame for the themes and questions used in data collections must be formulated for the concepts and information needs underpinning the survey.

It is important that research hypotheses related to information needs be as accurately formulated as possible. The task of data collection is to confirm or dismiss these hypotheses and each question is to be directed at these hypotheses. Hypotheses also appropriately delineate the quantity of the data to be collected. The number of the questions and data should be just enough to be able to respond to these hypotheses.

A detailed survey design should include possible frames for sampling, a short description of the sampling methods and a list of factors determining the realization of the sample.

Sampling and observation units, data providers and their number must be determined. An estimate must be made for the rate of non-response affecting resources, costs and scheduling.

Subsequent to the approval of the method of data collection, the conditions of application must be identified.

The optimal method is selected in the phase of preliminary planning; now the conditions of the application of the methods must be laid down.

If primary data are collected, detailed planning must cover material and technical conditions (e.g. printing houses or laptop in the case of interviewer-aided data collection, call centers in the case of telephone interviews and on-line systems in the case of Internet-based data collection), the human resources (e.g. area organizers, interviewers, supervisors, data processing staff) needed for the application of the given method.

If secondary data sources are used or data need to be transmitted, the technical and professional approaches needed for the application of the method must be identified.

If more than one data collection method is selected (multi-channel, "hybrid" data collection), the individual methods are aligned and a plan for detection and measuring the impacts arising from the various methods of data collection is prepared in this phase.

The detailed data collection plan should provide the basic information on planning and testing measuring tools (questionnaires).

Based on information needs, the scope of and method of testing measuring tools (questionnaires) and the implications related to completion and responses affecting cost planning and scheduling must be planned.

Planning aimed at the collecting of data ("field work") is a key element of preparation. Envisaged respondent burden must be assessed and methods increasing willingness to respond must also be taken into account.

"Field work", which means the distribution and collection of questionnaires in the case of institutional and population surveys is the token of efficient data collection. This determines the burden placed on respondents and the extent to which respondents will be willing to provide the requested information. Therefore, when the feasibility of data collection and field work is planned, this should be taken into account and methods most capable of motivating data suppliers must also include in the plan.

The planning of the methodology of data collection must include a preliminary plan of data processing and data publication.

Data collections are efficient and able to use resources sparingly if the tasks following data collection are contemplated upon in detail early on in the planning phase: the conditions of data preparation, processing, protection, generation and publication.

Older on-going surveys should be regularly reviewed at regular interviews to check whether the activity is still satisfactory from the perspective of the original ideas, concepts and information needs. A detailed data collection plan should also be made for these revisions.

Statistical programmes must be developed, revised and upgraded in accordance with user needs. The objectives, considerations and methods of the activity must be revised from time to time in order for the relevance of the results to increase or to respond to expanding and changing user needs. A detailed implementation plan protocol in a standardized format can also be used for revisions.

Quality Dimension

- ✓ Soundness of implementation
- ✓ Managing respondent burden

Possible quality indicators

- ✓ Number of the versions of a detailed implementation plan (number of professional discussions)
- ✓ Number of considerations in the plan (number of considerations on which planning is based, the number of the criteria it addresses)
- ✓ How well does the collection method suit the nature and volume of the information to be gathered?

- ✓ Ratio of finalised professional considerations to those requiring further decisions (i.e. the degree to which it is a plan based on finalised definitive professional considerations or it is still inconclusive and requires revision or re-thinking)
- ✓ Ratio of realised professional considerations to those not realised (i.e. the degree to which planning was solid and well-thought-out) after data collection
- ✓ Is the process re-using known methods and collection systems, e.g. according to guidelines / recommendations?
- ✓ Is there a communication plan encouraging response by informing potential respondents about the survey and the importance of their contribution?
- ✓ Percentage of questions used to collect information which will not be published (and motivation).
- ✓ Indirect evaluation of response burden: number of questions on the questionnaire
- ✓ Is there a communication plan encouraging response by informing potential respondents about the survey and the importance of their contribution?
- ✓ Extent to which administrative data integration techniques are understood and specified, both for direct and indirect use of ADS

2.4 Design frame and sample

This sub-process only applies to processes which involve data collection based on sampling, such as through statistical surveys. It identifies and specifies the population of interest, defines a sampling frame (and, where necessary, the register from which it is derived), and determines the most appropriate sampling criteria and methodology (which could include complete enumeration). Common sources for a sampling frame are administrative and statistical registers, censuses and information from other sample surveys. It may include geospatial data and classifications. This sub-process describes how these sources can be combined if needed. Analysis of whether the frame covers the target population should be performed. A sampling plan should be made. The actual sample is created in sub-process 4.1 (Create frame and select sample), using the methodology specified in this sub-process.

Quality guidelines

Frames used for surveys should correspond to target populations.
Possible frames, their feasibility and quality should be considered in the course of planning. The results of these considerations must be taken into account in the process of selection and establishing the survey frames.

Ideally, the population (the survey population) that can be covered by a frame corresponds to or approximates the target population. The difference between the two populations affects estimates, which can be characterized by under-coverage and over-coverage. If a frame does not cover a certain subpopulation and there is another one that does, their joint use should be contemplated upon.
The quality of frames is further characterized by the number of duplicates and erroneous pieces of information and timeliness.

The applicability of frames is closely related to – in addition to the identification of units – accessible information that can make either sample designer weighting scheme more efficient.
Sometimes the objective of the survey puts restrictions on the type of the frame to be used. E.g. post enumeration survey and applied estimation techniques may require area sampling.

In addition to the quality of the frame, all the impacts implied by the application of the frame on expected accuracy, costs and comparability must be taken into account in the selection process.

Various frames allow for the possibility of designing samples of different degree of efficiency. This directly influences expected accuracy, the effective and actual sample size and the costs of the survey.

Estimates should be able to be comparable with the estimates of other surveys, in particular, with earlier estimates in the case of periodic surveys. Applying the same frame for identical target population surveys improves comparability.

In addition to the above considerations, the same frame should be used for similar or identical target population surveys inside the statistical organization.

In order for respondent burden to be shared, the samples of various surveys are likely to be characterized with negative co-ordination, irrespective of the frame applied.
Various frames allow for the possibility of various selection schemes; due to this, given negative co-ordination, the sample of a survey selected from one frame may adversely affect the implementation of the selection scheme of the survey using another frame.

If there is no listed frames that can guarantee appropriate quality, an area frame* should be used, or *alternatively, two-phase or indirect sampling should be contemplated upon.
If an area or time frame is used, division that is not overlapping and providing full coverage must be ensured.
Typically, area and two-phase sampling is likely to be less efficient; before it is used, its efficiency must be checked.

In the case of the joint use of several frames, at least for the units of the selected sample it should be ensured that their correspondences to the individual frames are identified.

The possibility of the joint use of several frames should be contemplated upon if the populations covered by them are overlapping.

The joint use of several frames is likely to make planning, implementation and processing more complicated, which may increase costs. In the interest of improving accuracy, it is inevitable in some cases, however.

Sample design and selection scheme should be prepared in a manner that enables future estimates to satisfy the needs identified in 1.3 with the budget available for planning observed.
Efforts should be made to design a probability sample. If we depart from the probability samples, we must place great store by the validation of the method applied and the validation of the results.

In the case of non-probability samples, mathematical statistical procedures can only be used with limited reliability.

Efforts should be made at using optimal techniques; however, their possible drawback must also be factored in. In this context, possible auxiliary information should be mapped.

- Stratification, allocation and selection may be optimized. However, optimal samples are “only” optimal from a certain point of view in respect of some variable(s). In the case of a Multi-purpose survey, it must be checked whether a sample that is optimal in respect of one or more key variables does not affect the other variables detrimentally.

- This holds true particularly for continuous/longitudinal surveys where sample design optimal at the planning stage may lose its efficiency over time. Samples with efficiency that remains stable over time should be designed.
- No matter how efficient e.g. 1 PSU per stratum type sample is, it should be used with care because accuracy can only be described to a limited degree in this case.
- The auxiliary information available for sample design must be mapped. Possible sources of auxiliary information: sampling frames, censuses, samples of earlier surveys and administrative data sources. Subject to sources, auxiliary information can be used in the various phases of planning.

Although separable, the individual sampling techniques (stratification, allocation and selection) interact with each other and affect the manner of their application as well. This fact should be factored in the planning.

Stratification and its efficiency depend on the way sampling units are selected (strata that are homogeneous from a different perspective must be established).
The efficiency of stratification and optimal stratum boundaries depend on the allocation applied.

Obviously, user needs and precision requirements affect planning. However, in addition to them, the estimator applied must also be taken into account.

- Precision requirements for cross-sectional estimates affect the sample size directly.
- In the case of periodic/continuous surveys, precision requirements for estimates of changes, the load ability of data providers and expected attrition all influence the rotation scheme used.
- Needs for domain estimates can be satisfied if they are included in e.g. the stratification factors.
- The application of future small area estimates is also likely to affect sample designs.
- Reduction in variance due to weighting or calibration should also be taken into account.

In the case of continuous/periodic surveys a sampling design easy to reshape should be prepared.

User needs and changes in populations may necessitate changes in sample designs over time (sample size, allocation). Accordingly, a sample design should be made and the efficiency of the design should be regularly monitored.
Changes should be planned in a manner that leads to the lowest possible breaks in the time series.

The number of selection stages/phases should be kept to the minimum.

As the number of selection stages/phases generally increase variance, they should be kept at minimum. In certain cases their application may be justified (budget, frame-related difficulties).

When determining sample size, precision requirements, design effect, frame errors and expected non-response rates should be taken into account.
The necessary information can be obtained from earlier and/or similar surveys.

When designing a sample, the basic principles applied by the office to sample coordination (e.g. respondent burden, suitability for surveys, etc.) should be observed.

Deliberate co-ordination is a characteristic of samples pertaining to the same target population. Subject to the survey in question, this may refer to PSU's or FSU's. This may affect the planning of the sample of a given survey, which must be borne in mind.

Comprehensive studies on the individual sampling techniques and possible sample designs should be conducted.

- There are different ways of creating sample designs. In order to be able to choose from among the possible solutions, techniques and their combinations, we must familiarize ourselves with their impact.
- E.g. censuses or administrative data sources offer excellent opportunities for this. Designs can be tested on them. The impact of the individual sampling techniques on accuracy can be assessed; furthermore, their efficient combinations can also be identified, etc.
- In the case of a skewed population, when should 1 probability selection be applied?
- The impact of the possible selection methods (srs, pps, sys)
- What results are various types of stratification and allocations likely to yield?
- Cluster or element sampling can be tested.

The measuring tools of data collection must be designed in a fashion that enables us to collect data in accordance with our needs; moreover, they should be fit for use and operate properly.

In the case of surveys, the measuring tools include questionnaires and data carriers (e.g. laptops) with the questionnaires saved on them as well as auxiliary support materials (e.g. answer sheets, guides and demonstration tools) produced by experts on the basis of survey concepts in the phase of operationalization. Measuring tools should be able to collect process and analyze the information needed. I.e. they should be able to measure what we want them to measure and fit for use by both data collectors and data providers.
In the case of data collections other than those based on interviews (e.g. observations, surveys, observation of what is called "land cover", price surveys, data selection, data transmission) query programs (and the related data carrier devices) are the measuring tools. When designing them, it is important that efforts be made to ensure that the required data are accessible, specifications are accurate and the query software operates properly.

Questionnaires matching the mode of data collection must be designed. In the case of mixed mode surveys, questionnaires should be synchronized in order that mode effects can be reduced.

Different data collection methods require questionnaires with different structures, contents, lengths and registers (e.g. if interviewer-aided, questionnaires can be for longer and more complex and with a colloquial register; if self-completed, they should be simpler and more concise; if telephone-based, they should be brief, etc.). If more than one models used in a survey (e.g. hybrid or mixed mode surveys), questionnaires must be synchronized so that the mode effect can be reduced.
Furthermore, attention must be paid to the higher costs of the production of the questionnaires necessitated by the various data collection methods because the form-related and the technical aspects of the production of hard-copy, laptop-based or Internet-based, on-line questionnaires require different development.

Questionnaires should be designed in a fashion that they can collect the required data while placing the least possible burden on respondents.

Many work with questionnaires. The interests of the staff in charge of processing, interviewers and respondents may well be at variance with each other. E.g. statisticians are interested in detailed answers and open-ended questions, which, however, place immense burden on respondents; interviewers are interested in short interviews, by contrast, statisticians require the highest possible number of answers; interviewers are interested in short questions, which, however, respondents cannot always interpret; statisticians are interested in neutral, unbiased answers. Interviewers, however, cannot resist this or respondents also ask them for their opinions, etc. These considerations must be brought in line with each other, with the consequences arising from the differences deliberated upon.

Questionnaires should be designed in a fashion that they can collect the required data while placing the least possible burden on respondents.

During questionnaire-based data collections efforts must be made to reduce the burden that filling out the questionnaire places on respondents. If data collection is interviewer-aided, interviewers must be prepared to acquire professionalism that helps them perform their job fast and efficiently. If respondents fill out questionnaires on their own, the clear wording of questions, an easy-to-follow structure of questionnaires and concise clear guides can facilitate simple and fast answers.

Questionnaire designing is a multi-stage iterative process where none of the stages should be skipped.

Questionnaires should not be compiled at desks. Designing questionnaires should not be commenced by formulating questions. First, hypotheses related to information needs must be identified; then, measurable indicators are linked to them, and finally, they have to be transformed into questions. First, draft questions should be formulated. Then questions with the most appropriate content, methodology, form and structure can be framed and put in the right order along logical, psychological and methodological,etc. considerations on the finalized questionnaire.

Designing should take a number of approaches to compiling questionnaires and questions into account such methodologies, contents, formats, response psychology, interviewing techniques as well as language and register. Simultaneously, great store should also be set by the process ability and analyzability of answers.

Questions only in a number and with content that can yield relevant answers and are important from the perspective of the survey (providing an answer to a hypothesis) should be phrased.
When wording questions it is important that response psychology and the difficulties of recalling, remembering and answering should be taken into account; in the case of business statistics, registers maintained by businesses for other purposes should also be considered. Accurately worded questions (e.g. providing points of reference and reference periods assisting memory and avoiding vague phrases, foreign words, suggestive wording, overlapping categories and complicated calculations) help respondent answer them easily.
The register, wording and vocabulary of the questions should correspond to target population.
The structure of the questionnaire and the place of the questions on it should be easy to follow and its layout should encourage completion.
The process ability and analyzability of answers are another aspect to be taken into account, e.g. uniform scales, codes and sings should be used. By asking smoothly functioning questions, we can reduce the likelihood of answers such as “I don’t know”, “That does not pertain to my case” or “I don’t wish to answer it”.

Quantitative and qualitative tests (several if possible) showing the usability of questionnaires are an integral part of designing questionnaires.

Not only experts or statisticians should design questionnaires. They should be tested to see how comprehensible the questions on them are, whether they can be queried and completed. Let's use first simple forms of expressing opinions and qualitative methods from which those designing questions can obtain experience. Only then should costlier quantitative field work follow. Tests should always be followed by correcting questions and the questionnaire.

In order to be able to produce a design, we must be familiar with the individual process phases and where we wish to get, based on which the individual steps can be planned.

We need to have accurate knowledge of the data available to us and - in the case of data surveys - of the way these data are generated. We must also have clear knowledge of the purposes that we wish to use the data generated for and of the form in which we will publish them. Only accurately planned processes enable us to embed control points or make the necessary modifications.

Methodological designing of data processing is important.

Good methodologies can minimize errors efficiently. Furthermore, a methodological plan also helps provide an accurate description of objects, implement technical upgrades, direct processing and data analyses and schedule time accurately.

The design should be detailed and cover all stages of processing.

Designs for processing and data analyses should be sufficiently detailed so that all costs incurred can be calculated. In that way we can establish the degree to which our processing is cost efficient or feasible. If something turns out unfeasible in the course of the planning, what cannot be implemented can be corrected or re-planned. Important decisions capable of reducing costs are to be made at this juncture. At the same time, we need to strive to generate reliable data.

Consult experts.

We should consult experts if we have to address topics (themes) of which we do not have in-depth knowledge or if we cannot assess the impact that they may exert on processing.

Embed control points in each step.

We need to have an overview of the process. It is important that appropriate control points be embedded in the process so that data of satisfactory quality can be generated. If we receive data through more than one channel (self-completed questionnaires communicated over the Internet, hard copy formats with interviewers completing them or computer-aided versions etc.), control methods must be planned for each channel.

We must have some knowledge with possible errors, the flexibility and willingness to answer the questions of population or data providers.

If we are aware of the possible sources of errors, costs as well as the flexibility and willingness to answer the questions of population or data providers, this may help us create a more accurate design. We should also factor in the eventualities, i.e. things may turn out differently from what we expect;

plans should be sufficiently flexible or able to allow alterations so that we can perform processing and conduct analyses.

Pay attention of timing

We should pay attention of the dates by which data must be generated as well as the extent to which those data must be detailed.

Estimates are legitimately expected to be comparable. This should be borne in mind when the relevant steps of processing are planned.

If no professional argument can be raised against it, the steps that have a major impact on estimates (editing, imputing, outlier management, weighting and estimate functions) should be designed in the manner that facilitates their temporal and/or spatial comparability.
Accordingly, we should apply standards accepted in the profession as much as possible.
If we depart, for good reasons, from e.g. earlier practice (in processing or other elements of the survey),

Experience gained from similar surveys should be studied.

Earlier or other similar surveys and international examples help identify the areas to which special attention should be paid.

The planning of processing and other sub-processes of planning are likely to be interdependent, and impacts should be factored in.

Decisions in other sub-processes affect certain elements of processing directly (e.g. method of data collection). Furthermore, certain steps of processing may also affect other sub-processes, e.g. editing, imputing, weighting and estimates may require the observation of criteria that otherwise would not be included in the questionnaire. These impacts must be identified early on in the planning phase.

Before compiling the work plan, the entire process of data generation must be overviewed. The phases must be aligned with each other without any gap or redundancy. If there is a phase not identified earlier in the process, it must be identified.

As the objective of the sub-process is the compilation of a work plan covering all process phases, it is inevitable that the entire process should be overviewed before the compilation of the plan. During this, it must be checked whether all the steps of the data generation process were identified in the preceding processes and whether the methods of the sub-processes have been brought in line with each other. If there is a component in the process that has not been identified or the individual sub-processes are at variance with each other, then they must be defined and remedied respectively.

The work plan must describe the survey frame and identify the data sources to be used.

The work plan must describe the survey frame defined earlier and identify the data sources to be used in the process. When data sources are described, the phases of the process where they are used must be identified.

The process of the survey must be presented at the level of the individual activities, i.e. the tasks to be performed in the individual sub-processes and the order in which they follow each other must be presented.

Sub-sequent to the identification of the survey frame, the entire process must be presented in the work plan. As implementation is based on this document, it must describe the entire process from the first step to the last.
There may be sub-processes that cannot be accurately defined when the plan is being drawn up. In this case, at least a mention of the planned sub-process must be included in the description, and later on, the sub-process can be identified in the form of separate directives.

The time and resource requirements of the activities in the process phases as well as the relevant deadlines must be identified.

The work plan must cover the entire data generation process period, the scheduling of the sub-processes and the deadlines for all the activities to be performed in the process.

- Milestones representing the closing of the major processes must also be identified.
- Scheduling is a continuous iterative activity as unforeseen events may affect the scheduling identified here. The deadlines for the major milestones must be observed as much as such is reasonably possible.

Quality Dimension

✓ Methodological soundness

Possible quality indicators

✓ Under-coverage
✓ Over-coverage
✓ Number of duplications
✓ Classification errors
✓ Envisaged versus actual sampling errors (standard errors)
✓ Envisaged versus actual sample size (panel attrition)
✓ Design effect
✓ Timeliness of the frame: how recently was the frame last updated?
✓ Do unique identification numbers for statistical units exist?

2.5 Design processing and analysis

This sub-process designs the statistical processing methodology to be applied during the "Process" and "Analyse" phases. This can include among others, specification of routines and rules for coding, editing and imputation which may vary based on the mode of data collection and source of data. This sub-process also includes design of specifications for data integration from multiple data sources, validation of data and estimation. Statistical disclosure control methods are also designed here if they are specific to this business process.

Quality dimension

✓ Cost effectiveness
✓ Soundness of implementation

Possible quality indicators

- ✓ To what extent is the process planning to re-use systems for coding, E&I, data integration, weighting, estimation
- ✓ To what extent is the business process using standard or well-known methods for subsequent phases (e.g. coding, E&I, data integration, weighting, estimation, revision), in a transparent way?
- ✓ Implementation subsequent phases (e.g. coding, E&I, data integration, weighting, estimation, etc.) last been assessed?

2.6 Design production systems and workflow

This sub-process determines the workflow from data collection to dissemination, taking an overview of all the processes required within the whole production process and ensuring that they fit together efficiently with no gaps or redundancies. Various systems and databases are needed throughout the process. The GSBPM can be used as the basis of the business architecture layer when a statistical organisation has an existing enterprise architecture in place. The design might be adjusted to fit the organization. A general principle is to reuse processes and technology across many statistical business processes, so existing production solutions (e.g. services, systems and databases) should be examined first, to determine whether they are fit for purpose for this specific production process, then, if any gaps are identified, new solutions should be designed. This sub-process also considers how staff will interact with systems and who will be responsible for what and when.

Quality guideline

The plan should identify the organization of implementation as well as the persons responsible for the individual activities.

The actual order of the implementation of data generation must be included in the work plan. I.e. the persons performing the individual activities and the relationship between the individual participants must be identified. The participants allocated to the processes (process side) and the human resource requirements of the individual activities are described.

The document must contain the description of the tasks and authorizations of participants allocated to the activities in the various work phases.

The tasks of the participants allocated to the activities must be identified in detail. The tasks and authorizations in the various roles must be identified (participant's side). If one participant participates in more than one sub-process, his/her tasks must be described separately in the individual sub-processes.

The work plan should also include the systems and the IT tools to be used.

Several systems and IT tools to be identified in this sub-process can be relied upon. As a basic policy, the systems already available must be used. To this end, the characteristic and usability of the systems already available must be mapped. If these systems fail to meet the criteria needed for the implementation of the process, a new solution must be found.

The plan must have a detailed description of the tools to be used (e.g. printed materials, IT tools and systems) and their use.

A description of the tools to be used (questionnaires, support materials, IT tools and technologies) is indispensable for the implementation of the process. Thus, the sub-processes in which the individual tools are used, as the participants using them as well the manner in which they have to be used must be identified.

In order to be able to compile the work plan, we need to draw up a financial plan and procedural rules for financial settlement.

The work plan must contain the individual steps of data generation and the information linked to implementation; furthermore, it must also contain the financial resources needed for implementation. All expenses on all sub-processes, the individual fares as well as the costs of human resources and the tools to be used must be identified. Simultaneously, procedural rules for financial settlement must be laid down, i.e. certification rights linked to the individual roles and the procedural rules for the preparation of the necessary documents must be identified.

The preparatory document should include a clear and concise description of the contemplated process referring to the main process phases.

When the process is described, it should be concise, i.e. the document to be made here must focus on the major components of the work plan compiled earlier if the decision is made on the launch of the process.
If the decision is made on a certain part of the process, then the description must be more detailed, but to the point.

The plan should contain the scheduling of the implementation along the main milestones.

The plan should contain the scheduling of the process or the sub-process affected by the decision along the main milestones and the human resources requirements of the various phases.

The decision preparation plan should contain decision points and alternatives.

The decision preparation plan should contain decision points and alternatives of the implementation of the individual sub-processes or the entire implementation. Accordingly, it should detail the possible methods of the implementation of the process or sub-process, of which one is selected.
If there are no decision points (i.e. only one solution is possible or professional considerations only allow one solution), the draft implementation proposal must be put forth with circumspection in a manner that checks all circumstances underpinning the proposal.

The plan should examine the risks of the alternatives related to the decision points.

A key element of the preparation material is the examination of the outcome and risks of alternative decisions (e.g. the risk of changing of a process while it is still in progress).
If a new process is launched, this may mean the examination of the critical elements and the mapping of external risk factors (e.g. by means of a SWOT analysis).

The preparation document should contain the analysis of resources requirements and the costs linked to the individual decision points.

Another key component of the decision-preparation document is the analysis of resources requirements and the costs linked to the individual decision points, i.e. the cost implications and other resources requirements of the alternatives. Part of this is a cost-benefit analysis showing the impact of the possible alternatives or the selection of methods on the costs of the process.
The impact of the decision points on scheduling must be described.

If the alternatives of the decision points affect the scheduling of the process or sub-process, the change that is brought about by the decision must be identified.

The tasks that will change in the wake of the decision must be identified.

The new tasks that emerge in the process or the tasks that will change must be identified with regard to the decision points. If the decision is on the launch of the process, it is the identification itself of the tasks related to the description of the process.

Quality dimension

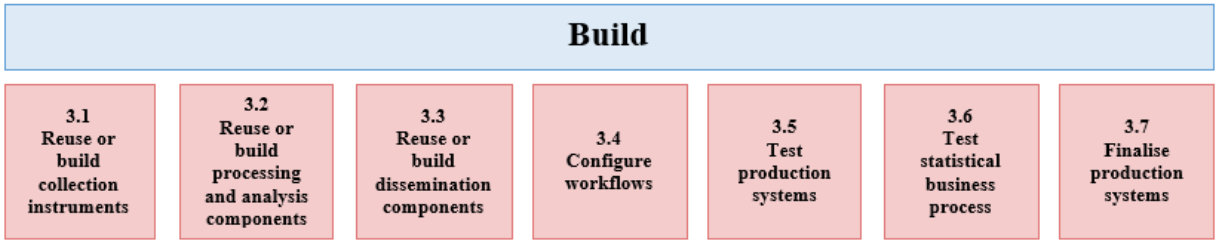
- ✓ Soundness of implementation
- ✓ Cost effectiveness
- ✓ Accuracy and reliability
- ✓ Timeliness and Punctuality
- ✓ Accessibility and clarity

Possible quality indicators

- ✓ Number of metadata consultations (ESMS) within a statistical domain for a given time period.
- ✓ This indicator is applicable:
    - to all statistical processes;
    - to producers
- ✓ Percentage of identified and documented GSBPM processes (with sub-processes) with their flows
- ✓ Percentage of/Extent to which corporate solutions (e.g. tools, processes, technologies) are reused in subsequent phases and sub-processes
- ✓ Percentage of/Extent to which responsibilities for subsequent phases and sub-processes have been set
- ✓ The number of social media visitors/followers
- ✓ Percentage of/ Extent to which quality indicators are planned to be calculated for subsequent sub-processes of GSBPM
- ✓ Amount/percentage of quality indicators used as KPIs
- ✓ Planned time frame for subsequent phases and sub-processes
- ✓ Length of time spent filling out the questionnaire
- ✓ Number of questions requiring the respondent to perform complicated calculations
- ✓ Number of unit non-responses
- ✓ Number of instances of lack of interest in the given topic or the complexity and length of the questionnaire as reasons for unit non-responses
- ✓ Number of item non-responses
- ✓ Number of “I don’t know” and “I don’t wish to answer it” answers
- ✓ Occurrence of system misses (because of non-pertaining questions; if there are too many, the

questionnaire is not appropriate; analyses will be scanty)
- ✓ The degree to which questionnaires are completed (%)
- ✓ Number of data to be corrected and supplied ex post (based on actual results rather than forecasts)
- ✓ Time requirement of work processes
- ✓ Missing components of the work plan
- ✓ Compliance with deadlines

3. Build phase



This phase builds and tests the production solution to the point where it is ready for use in the "live" environment. The outputs of the "Design" phase are assembled and configured in this phase to create the complete operational environment to run the process. New services are built by exception, created in response to gaps in the existing catalogue of services sourced from within the organisation and externally. These new services are constructed to be broadly reusable in alignment with the business architecture of the organisation where possible.

For statistical outputs produced on a regular basis, this phase usually occurs for the first iteration, following a review or a change in methodology or technology, rather than for every iteration.

The “Build” phase is broken down into seven sub-processes (schema above), which are generally sequential, from left to right, but can also occur in parallel, and can be iterative. The first three sub-processes are concerned with the development and improvement of systems used in collection, processing, analysis and dissemination of data. The last four sub-processes focus on the end-to-end process. These sub-processes are:

3.1 Reuse or build collection instruments

This sub-process describes the activities to build and reuse the collection instruments to be used during the "Collect" phase. The collection instruments are built based on the design specifications created during the "Design" phase. A collection may use one or more modes to receive the data (e.g. personal or telephone interviews; paper, electronic or web questionnaires; SDMX web services). Collection instruments may also be data extraction routines used to gather data from existing statistical or administrative registers (e.g. by using existing service interfaces). This sub-process also includes preparing and testing the contents and functioning of that collection instrument (e.g. cognitive testing of the questions in a questionnaire). It is recommended to consider the direct connection of collection instruments to a metadata system, so that metadata can be more easily captured in the collection phase. Connecting metadata and data at the point of capture can save work in later phases. Capturing the metrics of data collection (paradata) is also an important consideration in this sub-process for calculating and analysing process quality indicators.

Quality guidelines

The tools of data collection must be tested before their live launch: it must be checked whether they will provide data on what we need and how we need it and whether these tools can function properly. (As well as the measuring tools, the entire data collection process must also be tested in a next phase.)

In the case of surveys, the measuring tools include questionnaires and data collection tools (e.g. laptops, self-completion electronically) with the questionnaires saved on them as well as auxiliary support materials (e.g. answer sheets, guides and demonstration tools) produced by experts on the basis of survey concepts in the phase of operationalization. Before the live launch of the survey measuring tools designed the desk must be tested to see whether e.g. the questionnaires will measure what we wish them to and whether data collectors and data providers will be able to use them.
In the case of data collections other than those based on interviews (e.g. observations, surveys, data selection, data transmissions) query programs (and the related data carrier devices) are the measuring tools. It must be checked whether we can access the data with the given tool, the technical and IT conditions of transmission data are appropriate and the query software functions properly.

Qualitative tests requiring more moderate resources should precede "field tests". **(see Chapter III.4)**

The results of the tests are properly functioning measuring tools, credible data supply and, hence, good quality data.

Measuring tools can be tested in various forms from the simplest form of expert opinions through informal, small sample-based tests, cognitive interviews, focus group testing to quantitative tests on larger samples at the future location of data collection ("field") producing quantifiable results (e.g. split sample tests, a test run). Due to the significant resources they require, the latter should only be resorted to after the measuring tools have been corrected on the basis of the qualitative methods.

We may uses various methods of testing, making the most of their special results. We should familiarize ourselves with the advantages and disadvantages of the individual methods.

Various testing methods have various advantages and disadvantages. We should apply the most possible testing methods making the most of their advantages. E.g. the cognitive methods allow those compiling the questionnaire the possibility of experiencing the usability of their "creation" in person. Both the interviewer and the interviewee can report the problems encountered, which can easily shed light on – inter alia – errors stemming from interviewee interpretation. However, the disadvantages of the individual methods must also be reckoned with. E.g. expert opinions or interviewer's feedback only indicate(s) one-sided consideration, cognitive interviews indicate errors only on a small number of elements and informal testing cannot explain the reasons for erroneous interpretation, it only records the problem.

Testing should always be followed by the revision or correction of measuring tools.

Testing makes sense only if the errors emerging during testing are followed by the revision and correction of measuring tools. If we conduct more than one test, we should utilize the results of them all. Sometimes, however, we need to decide whether we can take the error into consideration or not (e.g. we cannot make a question shorter if that impairs its clarity). It is important that we should report the fact that we cannot utilize the results of a test (e.g. because we cannot insert a new question in the time series of a question used for years).

In the case of data transmissions and queries errors and defects identified during testing should lead to the modification of the technical tools or the query programme.

Quality Dimension

- ✓ Soundness of implementation
- ✓ Managing respondent burden
- ✓ Accuracy and reliability
- ✓ Accessibility and clarity

Possible quality indicators

- ✓ If mixed or multiple data collection modes are adopted, has the mode effect on data quality been tested?
- ✓ Percentage of questions used to collect information which will not be published (and motivation).
- ✓ Has the questionnaire been tested using appropriate methods (e.g. questionnaire pretest, pilot in real situation, in depth - interviews, focus groups, interviewer support, etc.)?
- ✓ Have the test results been taken into account in the process of implementing the final questionnaire, and documented in a report?
- ✓ To what extent have the test results been taken into account in the process of implementing the final data collection tools
- ✓ Have administrative data collection systems/interfaces been tested and how?
- ✓ Have the test results been taken into account in the process of implementing the final data collection modes?
- ✓ Extent to which paradata can be captured at the data collection stage?
- ✓ Extent to which metadata can be captured at the data collection stage and stored in metadata management systems?
- ✓ Do collection instruments allow for coding to the lowest level of the classifications agreed upon in design phase?
- ✓ Was there any testing method in the course of developing measuring tools? If yes, how many?
- ✓ In the case of how many new versions of questionnaires, data transmissions and data selections how many new query programme versions were made on the basis of the tests?
- ✓ How many of the questions/specifications provided by researchers had to/were possible to be corrected on the basis of testing?
- ✓ How many concepts were differently interpreted by the respondents participating in the testing?
- ✓ How many times did respondents need clarification because they did not understand a question in the course of the testing?
- ✓ How many questions are likely to result in uncertain (unfounded, off-the-cuff or inaccurate) answers on the basis of the testing?
- ✓ How many times did the interviewer rephrase a question in his/her own words?
- ✓ How many mistakes did the interviewer/data supplier make while filling out the questionnaire (e.g. misses questions, over-answers questions, writes the answer in the wrong place)

3.2 Reuse or build analysis components

This sub-process describes the activities to reuse existing components or build new components needed for the “Process” and “Analyse” phases, as designed in the "Design" phase. Services may include

dashboard functions and features, information services, transformation functions, geospatial data services, workflow frameworks, provider and metadata management services.

Quality guidelines

IT tools serving the purposes of data collection appropriately and helping smooth, efficient and quality data collection should be selected.

From among the numerous IT tools supporting data collection (e.g. laptops, PDA's, Internet-based platforms, call centers and programs assisting organization), a tool that furthers the objectives of data collection the best and suits the needs and opportunities of interviewers, organizers and data providers must be selected.

The tools should meet state-of-the-art IT requirements while taking users' hardware and software capabilities into account. Compatibility with user environment is indispensable for the successful data collection.

The tools should still meet state-of-the-art IT requirements. Nevertheless, the capabilities of IT environment of the participants in data collection (e.g. data providers, interviewers, processing and recording staff) should be taken into account. For instance, we cannot use a programme that requires rather complex installation or a separate upgrade on the user side (or in the case of questionnaire completing programs, on the respondent side).

The aspect of good resource management combined with quality considerations should affect the selection of tools.

That does compromise the quality of data collection. E.g. the issue of whether or not develop a questionnaire completing programme should depend on user needs rather than the costs of the development. In the case of small sample surveys, when we have to choose between an optical character recognition system and manual data entry, costs must be deliberated upon against gains on data quality (if, e.g. a questionnaire is easy to follow, manual entry makes more sense).

IT tools should simplify data collection and increase its efficiency; they should not add to administrative burden or the difficulties involved in operating modern technologies.

The objectives of computer solutions aiding the completion of questionnaires (e.g. laptops used by respondents, PDA's or Internet-based data provider platforms) are to increase the speed and quality of data collection and decrease respondent burden. These objectives cannot be restricted or mitigated by new burden accompanying IT development (e.g. complicated log-in procedures regarding platforms for completing questionnaires, a system that is difficult to follow or time consuming procedures). Programs supporting the organization of data collection are supposed to simplify the work to be performed by the staff in charge of organization/arrangements. Therefore, we must ensure that they do not contain unnecessary tasks that add to red tape. The technological burden (e.g. complicated uploading or complicated operation of technologies) of using IT tools is another consideration, because it cannot be higher than the burden of not using them at all.

Standard IT tools should be used for surveys. The use of standard tools adds to flexibility, transparency and quality and is likely to reduce costs.

Quality Dimension

- ✓ Soundness of implementation
- ✓ Accuracy and reliability

Possible quality indicators

- ✓ What proportion of functions in the statistical process are built using corporately supported software tools, components or services?
- ✓ Have Enterprise Architecture best practices for software development been followed?
- ✓ Has testing been done throughout the Building process?
- ✓ Have corporate requirements for dashboards and information services been incorporated
- ✓ Was the testing strategy designed when the process and its components were designed?
- ✓ Was additional testing done by someone other than the person(s) who did the programming?
- ✓ Were the different types of testing designed, executed, documented and signed-off:
- ✓ Was testing done specifically to ensure that the software produces the correct results?
- ✓ Extent to which process components that have complete documentation, support staff, and user training, all available at the same time that the software is put into use.
- ✓ Has the quality of the data after the test of the coding procedure been assessed (e.g. quality indicators such as "recall rate" have been calculated)? The recall rate is calculated as the ratio between the number of values automatically coded and the total number of values submitted to coding.
- ✓ Have the assessment results been taken into account in the implementation of the final procedure?
- ✓ Has the output of the E&I procedure been assessed? (e.g. by simulation and by calculating indicators, analyzing distributions.)
- ✓ Have the assessment results been taken into account in the implementation of the finale procedure?
- ✓ Have the process components necessary to manage processing of large data sets been tested and how?
- ✓ Have process components for data linkage been tested and fine-tuned?
- ✓ Needs communicated by users of IT tools (content and number); number of those for whom these tools are suitable
- ✓ Number of difficulties encountered by users (interviewers, data providers, organizers, data capturing staff etc.)
- ✓ Characteristics of IT tools, specification of their state-of-the-art nature

3.3 Reuse or build dissemination components

This sub-process describes the activities to build new components or reuse existing components needed for the dissemination of statistical products as designed in sub-process 2.1 (Design outputs). All types of dissemination components are included, from those that produce traditional paper publications to those that provide web services, (linked) open data outputs, geospatial statistics, maps, or access to microdata.

Quality Dimension

- ✓ Managing metadata
- ✓ Accessibility and clarity

Possible quality indicators

- ✓ Extent to which relevant metadata can be linked to output data.
- ✓ Extent to which user requirements are fulfilled in terms of e.g. dissemination formats, information systems, graphical supports.

3.4 Configure workflows

This sub-process configures the workflow, systems and transformations used within the business processes, from data collection through to dissemination. In this sub-process, the workflow is configured based on the design created in sub-process 2.6 (Design production systems and workflows). This could include modifying a standardised workflow for a specific purpose, assembling the workflows for the different phases together (possibly with a workflow/business process management system) and configuring systems accordingly.

Quality Dimension

- ✓ Soundness of implementation
- ✓ Timeliness and punctuality

Possible quality indicators

- ✓ Ratio of the number of sub-processes automated through an IT tool to the total number of sub-processes specified in 2.6
- ✓ Planned timeliness of all subsequent phases and sub-processes

3.5 Test production system

This sub-process is concerned with the testing of assembled and configured services and related workflows. It includes technical testing and sign-off of new programmes and routines, as well as confirmation that existing routines from other statistical business processes are suitable for use in this case. Whilst part of this activity concerning the testing of individual components and services could logically be linked with sub-process 3.1, 3.2 and 3.3, this sub-process also includes testing of interactions between assembled and configured services, and ensuring that the whole production solution works in a coherent way.

Quality guideline

Each new or altered IT tool must be tested before its live launch.

In particular, new IT tools must be tested. The same should be performed in the case of alterations because even minor changes can lead to hitches in operation.

Testing should be conducted by both developers and the prospective users of the tools.

Participants taking part in testing should cover the widest possible group of stakeholders. Each group affected by the performance of a given task should be involved in testing. We should not be content with asking developers for their expert opinions.

Several trial tests and test runs should be conducted, as one test result does not suffice.

One test run does not suffice. Each tool must be tested with the participation of several testing parties and on a number of occasions.

Testing should be performed on the basis of consistent criteria.

A test protocol and a template comprising consistent criteria are recommended. This ensures that testing parties test the tools concerned according to identical criteria.

Test results should be documented

Each testing party should record test and summarize test results, based on which typical problems are identified. At the same time, however, specific observations should also be documented for future development.

Based on the results of testing, error should be remedied, tools developed and a new test run performed.

Based on the result of testing, tools should be developed. Especially, typical recurrent errors must be remedied; however, we should also pay attention to occasional errors occurring in a lower number.

The operability of tools should continue be monitored during their live operation. Occasional tests are also highly recommended.

Users of the tools should be able to report difficulties during live operation. Preparations towards this end should be made. A platform for sending and documenting feedback should be arranged for. In order to eliminate problems during use, we should be able to identify a period when we can do without the tool in question.

Quality dimension

- ✓ Soundness of implementation

Possible quality indicators

- ✓ Was there any testing method in the course of developing the tools? If yes, how many?
- ✓ How many criteria were applied to testing the tools (a uniform template)?
- ✓ How many types of problems did the testing staff report?
- ✓ How often did the testing staff report the same problem?
- ✓ How many new versions or upgrades were made on the basis of testing?
- ✓ Did any new problem emerge during the live use? If yes, how many?

During the pilot study close attention must be paid to the quality of the data sources to be used later.

Risks posed by unreliable initial data sources must be tested before the actual survey, i.e. the quality of the information available on the basic reporting units to be contacted in the future must be mapped. Thus, for instance, the quality of the selected addresses must be checked on the basis of the number of failed surveys which can be related to inaccuracy of the addresses.

When a pilot study is planned, we should ensure that the sample to be visited is of the appropriate size and has the required characteristics and that an appropriate location is selected.

This is the most important indicator of a successful pilot study. Key to success is that the sample identified as the survey population of the pilot study is designed as the characteristics of its observation units accords to those of the whole of the target population.
Another important aspect is the number of the unit to be contacted because the size of the units should be sufficient enough to be able to provide relevant results.

The indicators produced must be tested in order to see whether they are measurable and can measure the phenomena required.
In fact this is the final test of the questionnaire because the final study of the questions asked on the basis of the produced indicators is carried out now. This may shed light on what earlier qualitative methods could not identify, which, however, can lead to problems in the field or when used on major-size populations or bring about the unwanted results generation process and the problems for which we will have to prepare ourselves.

Quality Dimension

- ✓ Soundness of implementation

Possible quality indicators

- ✓ Have all programs, routines and configured services been individually tested and signed off prior to the start of testing
- ✓ Has the building of statistical units been tested and signed off?
- ✓ Has the quality of the linkage procedures been tested and signed off?
- ✓ Has the entire production system been tested and signed off, ensuring that data correctly enters and exits each programme, routine and configured service, and that the functionality of each programme, routine and configured service has been executed according to expectations?
- ✓ Proportion of surveys that failed due to inaccurate data sources (proportion of non-existing or unidentifiable reporting units)
- ✓ Non-response and rejection rates
- ✓ Number of failed contacts

3.6 Test statistical business process

This sub-process describes the activities to manage a field test or pilot of the statistical business process. Typically, it includes a small-scale data collection, to test the collection instruments, followed by processing and analysis of the collected data, to ensure the statistical business process performs as expected. Following the pilot, it may be necessary to go back to a previous step and make adjustments to collection instruments, systems or components. For a major statistical business process, e.g. a population census, there may be several iterations until the process is working satisfactorily.

Quality Dimension

- ✓ Cost effectiveness
- ✓ Accuracy and reliability
- ✓ Timeliness and punctuality
- ✓ Soundness of implementation

Possible quality indicators

- ✓ A2.Over-coverage rate
- ✓ A4. Unit non-response rate
- ✓ ESS QPI - TP2.Time lag – final results

3.7 Finalize production system

This sub-process includes the activities to put the assembled and configured processes and services, including modified and newly-created services, into production ready for use. The activities include:

- Producing documentation about the process components, including technical documentation and user manuals;
- Training the users on how to operate the process;
- Moving the process components into the production environment and ensuring they work as expected in that environment (this activity may also be part of sub-process 3.5 (Test production system)).

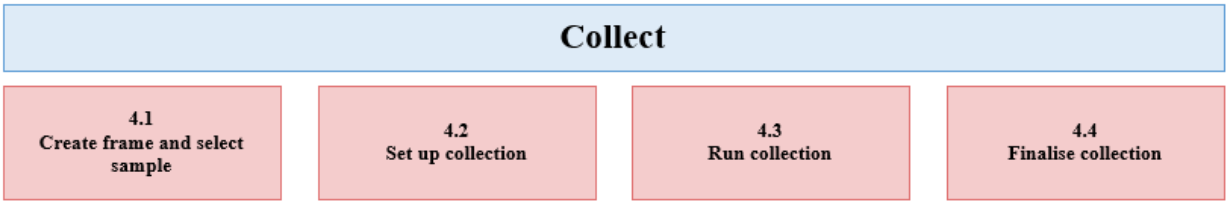
Quality Dimension

- ✓ Accessibility and Clarity

Possible quality indicators

- ✓ Percentage of materials adequately archived (e.g. easily retrievable; properly labelled; retention period indicated)

4. Collect phase



This phase collects or gathers all necessary information (e.g. data, metadata and paradata), using different collection modes (e.g. acquisition, collection, extraction, transfer), and loads them into the appropriate environment for further processing. Whilst it can include validation of data set formats, it does not include any transformations of the data themselves, as these are all done in the "Process" phase. For statistical outputs produced regularly, this phase occurs in each iteration.

The "Collect" phase is broken down into four sub-processes (schema above), which are generally sequential, from left to right, but can also occur in parallel, and can be iterative. These sub-processes are:

4.1 Create frame and select sample

This sub-process establishes the frame and selects the sample for this iteration of the collection, as specified in sub-process 2.4 (Design frame and sample). It also includes the coordination of samples between instances of the same business process (e.g. to manage overlap or rotation), and between different processes using a common frame or register (e.g. to manage overlap or to spread response

burden). Quality assurance and approval of the frame and the selected sample are also undertaken in this sub-process, though maintenance of underlying registers, from which frames for several statistical business processes are drawn, is treated as a separate business process. The sampling aspect of this sub-process is not usually relevant for processes based entirely on the use of pre-existing sources (e.g. administrative registers, web sites) as such processes generally create frames from the available data and then follow a census approach. Variables from administrative and other non-statistical sources of data can be used as auxiliary variables in the construction of sampling design.

Quality guideline

The satisfactorily up-to-date nature (timeliness) of the frame used for the survey must be ensured.

Registers or other data sources used by surveys should be as up to date as possible.
This holds true of the basic data of frame units (identification and availability) and, when appropriate, any other auxiliary information used for sampling. Creating frames and its update must be in line with the principles of 2.5.
The timeliness of the information indispensable for the co-ordination of samples is fundamental

Information on the selected sample must be accepted and stored.

In order that rotation samples can be managed and samples can be co-ordinated, the frame should store information on the samples using the units of the frame, the frequency of their using the element and disposition codes. This information can help coordinate samples, implement the contemplated rotation and keep response burden at an acceptable level.
Special attention should be paid to this task if the same population has to be reached by means of various surveys and frames or the same survey uses more than one overlapping frame. Correspondence between the individual frames at least at the level of the selected samples must be ensured.

The quality of the sample should be checked at regular intervals and the relevant stages of the process should be planned in a manner that serves this objective.

Information collected on the units of the selected sample helps characterizing the quality of the frame directly.
Towards this end, questionnaires and data collection/surveys must be planned appropriately (over-coverage, classification error and any other erroneous auxiliary information).
Special attention must be paid to ensuring and checking coverage in the case of area frames (samples). Studying over-coverage and erroneous units may help identify the cause and management of the problem. Information on the frame should be used to update and clarify the frame in respect of the units of the selected sample.
If more than one frame exists (and/or is used), coverage (even under coverage) can also be measured.

The selection of samples should be fully compliant with the theoretical design described in Section 2.6. All processing during selection, during stored.

Computability of the design weight for the selected sampling units must be ensured; the same holds true later on for the possibility of accurate variance estimation:

- information on stratification
- data on the identification of sampling units and
- the auxiliary information used,
- selection/inclusion probability,

- joint inclusion probability

Quality Dimension

- ✓ Accuracy and reliability
- ✓ Timeliness and punctuality
- ✓ Managing respondent burden

Possible quality indicators

- ✓ The rate of over-coverage: The proportion of units accessible via the frame that do not belong to the target
- ✓ If the survey has more than one unit type, a rate may be calculated for each type.
- ✓ If there is more than one frame or if over coverage rates vary strongly between subpopulations, rates should be separated.
- ✓ The rate of over-coverage is applicable:
    - o to all statistical processes (including use of administrative sources);
    - o to producers.
- ✓ Rate of missing or suspicious stratification and classification variables; rate of missing contact variables; time elapsed since last successful contact
- ✓ Unit nonresponse - rate.
- ✓ The sampling error can be expressed:
    - o in relative terms, in which case the relative standard error or, synonymously, the coefficient of variation (CV) is used.
    - o in terms of confidence intervals.
- ✓ Sampling errors indicators are applicable:
    - o to statistical processes based on probability samples or other sampling procedures allowing computation of such information.
    - o to users and producers, with different level of details given.
- ✓ A1. Sampling error - indicators
- ✓ Changes (extent of change) in the sampling frame (and the data source used by it) between the reference period of the survey and the frozen status of the frame
- ✓ Under-coverage
- ✓ Over-coverage
- ✓ Number of duplications
- ✓ Classification errors

4.2 Set up collection

This sub-process ensures that the people, processes and technology (e.g. web-based applications, GPS system) are ready to collect data and metadata, in all modes as designed. It takes place over a period of time, as it includes the strategy, planning and training activities in preparation for the specific instance of the statistical business process. Where the process is repeated regularly, some (or all) of these activities may not be explicitly required for each iteration. For one-off and new processes, these activities can be lengthy. For survey data, this sub-process includes:

- Preparing a collection strategy;
- Training collection staff;
- Training system using supervised machine learning techniques;
- Ensuring collection resources are available (e.g. laptops, collection apps, APIs);

- Agreeing on terms with any intermediate collection bodies, (e.g. sub-contractors for computer assisted telephone interviewing, web services);
- Configuring collection systems to request and receive the data;
- Ensuring the security of data to be collected;
- Preparing collection instruments (e.g. printing questionnaires, pre-filling them with existing data, loading questionnaires and data onto interviewers' computers, APIs, web scraping tools);
- Providing information for respondents (e.g. drafting letters or brochures explaining the purpose of the survey, notifying respondents when online reporting instruments will be made available);
- Translating of materials (e.g. into the different languages spoken or used in the country).

For non-survey sources, this sub-process ensures that the necessary processes, systems and confidentiality procedures are in place, to receive or extract the necessary information from the source. This includes:

- Evaluating requests to acquire the data and logging the request in a centralised inventory;
- Initiating contacts with organisations providing the data, and sending an introductory package with details on the process of acquiring the data;
- Checking detailed information about files and metadata with the data provider and receiving a test file to assess if data are fit for use;
- Arranging secure channels for the transmission of the data.

Quality guidelines

Each step of field implementation must be planned and stakeholders caused to familiarize themselves with including scheduling, responsible persons, powers and authorizations and resource requirements.

The planning phase of data collection is followed by implementation, which is preceded by the preparation of a draft schedule and resources plan containing the date and length of each main and sub-task, the names of responsible persons and participants, their powers and authorizations and the (human, material and technical) resource requirements for the performance of the individual tasks. All actors should familiarize themselves with and approve this schedule so that they can incorporate it into their own work plan and carry out the duties assigned to them in a responsible way.

The methods of field implementation must be identified consistently.

The principle of standardization must be asserted in the implementation of each task of data surveys; all steps must be taken using the same method, means and content in order that data can be generated under the same conditions.

Conditions for the organization of work must be provided; only then can quality work be expected.

The conditions laid down during the planning phase must be provided for implementation. Planning should check whether the material and technical conditions of data collection (e.g. laptops, printed materials, facilities needed for organization, tools needed for work and cars for transportation, etc.) and the necessary human resources (a satisfactory number of satisfactorily qualified organizers, interviewers, data recorders, transporters, etc.) are available. The financial resources needed for implementation must also be prepared (e.g. the costs of printing and training and the fee of interviewers, travel expenses and postal charges).

The channels and platforms of the flow of information needed for organization must be established.
Accurate, up-to-date and timely information is a fundamental condition for work. There may arise difficulties during data collection or new measures adopted. Stakeholders must be notified of such as quickly as possible so that data collection can be continued seamlessly. Field experience must be exchanged, problems reported and problem-solving proposals quickly communicated.

One of the most important quality requirements of data collection operations in the field is a reliable list of addresses. This must be prepared accordingly.

Before a list of data provider's addresses is drawn up must be preceded by the maintenance of addresses when addresses are clarified and validated. We check whether an address is still valid and any information on its modification has been received. During the live operation of data collection a revised accurate list of addresses is required so that deadlines and quantitative requirements can be met.

Great store must be set by the preparation of the interviewing staff because their work affects the quality of data fundamentally.

Even the most appropriately selected and designed measuring tool (questionnaire) can yield the right results only if those in charge of data collection have the right knowledge and are appropriately prepared to collect information in accordance with the expectations. Therefore, their training and preparation play an important role and requires careful planning and implementation. What needs to be thought over is the number, qualification and expertise of the interviewers and the knowledge they must acquire in order to be able to perform their work. Their preparation needs to be organized, whether they are trained at a central location or on-site, how they need to be trained and what channels should be used to communicate the necessary knowledge to them.

The quality of how prepared interviewers are must be ascertained.

A list of self-revision questions facilitating the understanding and the processing of the training and support materials provided for the preparation and providing feedback on how extensively those materials have been familiarized with should be compiled. In the case of more difficult or novel surveys, tests providing feedback on the acquisition of the relevant knowledge should also be compiled and the availability of practical skills (e.g. the use of laptops) should be tested in the form of personal tuition. Novice interviewees should be accompanied to the first few interviews so that any difficulty that may arise can be detected immediately. However, this does not provide a comprehensive overview of their abilities yet. That can be resolved by the application of the probation time scheme. Old interviewers should sometimes be checked to see how prepared they are for the interviews.

The training programme as well as the training and support materials provided for the preparation should meet the applicable professional expectations and be adjusted to the level of the knowledge of those concerned. Before finalization these must be tested. Several different forms of training should be used.

Those participating in conducting surveys should be prepared in as versatile a manner as possible. Possibility of home study facilitating the convergence of those with a differing level of knowledge should be granted; it encourages individual solutions and makes classroom tuition efficient because it can focus on the summary of the main points and practical knowledge.

We should bear the different ways in which individuals study. Therefore, teaching materials should conform to the different forms of internalization and understanding: they should be both textual and

visual; in the case of tools teaching forms promoting practice (e.g. notes, films, tools, personal tuition and consultations, etc.) should be preferred.
Teaching materials must be tested by their future users, based on which the necessary adjustments should be made.

Regional organizers training interviewers must also be prepared if training is not held at a central location. Here too, standardization is necessary because local organizers and trainers must provide information for all the participants of the operation in the same manner and with the same content.

Regarding the oral part of the training programme for interviewers, uniform materials to be used in the classroom e.g. detailed scenarios, presentation materials and support demo material, etc. should be prepared for local trainers. Texts should be uniformly worded lest trainers should come up with their own ideas (these can feature on the notes section of slides used for presentation purposes).

In the course of the preparation of data collection we should explore the potential in the relationship established with data providers and make sure that they are properly informed and encouraged.

Containing the characteristics of the target group to be reached, the forms, manners and channels of contacting them, and information to be provided for them, a communication plan aimed at establishing a relationship with data providers should be made.

Prior to actual training and as part of it, we should assess the availability of equipment in the classroom.

In the course of the training various devices e.g. overhead projectors and computers, may be needed, therefore, their availability must be checked in advance.

Both the satisfactory number and quality of the staff with respect to organization and preparation and the even spread of burden must be ensured.

Providing the conditions of work, assistance with work (appropriate infrastructures, tools, sensible deadlines and continuous availability). The optimal staffing level must be identified: staff includes both interviewers and organizers (organizers, representative coordinators, regional contact persons and interviewers) and those in charge of the urging and receipt of data. Continuous relationship and exchange of information between the individual participants is indispensable for efficient organization, co-ordination and preparation.
It is important that a stable staff of interviewers be created, trained and further trained and that the motivation, satisfaction and loyalty of staff be increased. Besides providing tools and training for interviewers to boost the efficiency of their work, we should strive to motivate them and ensure their commitment to the office.
Even spread of burden should be reached during the process of organization. Satisfactory attention must be paid to feedback on information gained during the receipt and urging of data, e.g. useful for future operations, feedback on the cause of missing data, changes in contact details and continuous update and maintenance of address lists, etc.

Punctuality at each juncture of the organization of data collection is important and deadline should be met.

Punctuality at each juncture of the organization of data collection is important and deadline should be met so that work can be performed as smoothly as possible and received data can be as accurate as

possible, (when e.g. a list of data providers is drawn up, questionnaires are printed, personalized questionnaires are compiled, electronic questionnaires are programmed, a list of addresses are drawn up, the scope of businesses is identified and questionnaires are communicated to the stakeholders).

General and professional training and preparation must be provided for the interviewers.

Key to successful data collection in the case of interview-type surveys is the professionalism of interviewers. Therefore, they should be provided with the tools needed for data collection and receive professional and general training. The objective of professional training is to familiarize interviewers with the data collection at hand and the related concepts (e.g. familiarity with the questionnaires and the objective of the given research). General training includes familiarity with field work (interviewing techniques, conflicts in the field, etc.)

A list of the addresses to be visited must be drawn up.

Clarification and the maintenance of addresses are both very important when population and institutional data are collected.
Based on the contact information provided on the cover sheet of the individual questionnaires, information on the seat of businesses and other data on them are maintained in the BR and data on contact persons are managed in the BR as well.
The following should be considered:

- identifying and reviewing the appropriate respondents, checking and screening samples, removing those outside the sample and including those left out;
- validation of addresses, visiting addresses (whether addresses (institutions) exist);
- keeping record of changes in addresses, improving and maintaining register data in the case of institutional data collection;
- interviewer-friendly districting, list of addresses, business cards providing assistance with work;
- validation of addresses, visiting addresses;
- in the case of institutional data collection contacting (mainly by phone) the respondents to report data in the following year and senior officers

Factors affecting data collection must be explored and fields must be prepared.

When **population data are surveyed**, regarding fields, it is important that geographical conditions, settlement structures, road conditions, maps, itineraries and accessibility should be checked.
Information for organisers and interviewers on local conditions (during preparation and in guides).

A control system must be set up in advance and the steps of data collection documented.

In the case **of institutional statistics**, continuous maintenance of the contact details of businesses by means of the IT software applied. Based on the characteristics of the business (statistical NACE codes, classification of businesses according to their business forms, staff categories, status codes, etc.), updating the scope of data collection.
Local event calendars: events that may hinder data collection (special features, events and holidays).
A schedule for checking interviewers and data must be established; in the case of computer-aided data collections, hopping and internal audits must be incorporated into the schedule, and messages alerting to mistypes and internal inconsistencies must also be made part of it. They all contribute to improving the quality of data.

An efficient control system should be established for the forwarding of questionnaires and their support materials in the course of supplying printed materials and the receipt of data. Unauthorized access to information must be prevented. So must loss of data arising from system errors and human factors.

A survey of incoming questionnaires should be organized (the persons in charge of this activity, the number of the questionnaires to be surveyed, tasks to do if difficulties are encountered).
In the course of data collection those in charge of direction may re-plan or modify the process on the basis of performance and quality indicators.
In the case of hard copy data collection, a letter of request, a letter from the president, a diary and a questionnaire are sent to data providers.

Preparation for unexpected difficulties

Preparations must be made for the unexpected, such as the breakdown of mobile devices or the unavailability of an interviewer. In the former case spare laptops or PDA's available in database come in handy. In the latter case the addresses not visited must be allocated to the available interviewers or there should be substitute interviewers, who should receive professional preparation and familiarize themselves with interviewing techniques (if they have not conducted interviews yet). A pool of substitute interviewers who could step in if unexpected difficulties are encountered should be set up.

In the case of multi-channel data collection various methods of organizations must be brought in line with each other.

If data are collected via more than one channel, both interviewers and telephone operators should receive training in personal interviews and interviewers should also be aware of the availability of the web-based completion of the questionnaires. It is important that interviewers should be familiar with the advantages, disadvantages and purposes of the method.
Experts should prepare data collection appropriately so that data can be satisfactorily connected after field work. Various channels must be brought in line with each other (e.g. respondents should not be disturbed as long as Internet-based completion is available).

Reliance on the experience of previous data collections and pilot studies.

If time and financial means permit, a pilot study should be conducted, which can offer useful experience. This can fine tune the letter of request and improve training and questionnaires etc.
Reliance on experience can reduce non-sampling errors, as a result of which the quality of data can also improve. This is especially important because the extent of non-sampling errors are difficult to manage ex post.
We should also rely on the experience of earlier data collections (e.g. focus group surveys).

Preparation can be particularly important if:

- We intend to use a new data collecting tool.
- Questions have been revised and replace with new ones.
- Additional questions have been included, which may have a contextual impact,
- Data collection tools have undergone material changes.
- Data providers or respondents and interviewers should participate in preliminary tests.

Quality Dimension

- ✓ Cost effectiveness
- ✓ Accuracy and reliability
- ✓ Timeliness and punctuality
- ✓ Soundness of implementation
- ✓ Accessibility and Clarity

Possible quality indicators

- ✓ Dimension of the test/field pilot compared to real survey
- ✓ Number of documents prepared for organization and training
- ✓ Estimated time frame for subsequent phases and sub-processes and divergences from planned one in design phase
- ✓ Percentage of materials adequately archived (e.g. easily retrievable; properly labeled; retention period indicated)
- ✓ Number of meetings and forums aimed at information transfer in the preparatory phase
- ✓ Assessment of major error sources from the Pilot (e.g. coverage, nonresponse, measurement, and process errors)
- ✓ Ratio of data collection staff to participants in organization and training
- ✓ Number of days spent on preparation relative to the number of implementation days
- ✓ Number of the forms of training where different methodologies were used
- ✓ Number of material prepared for training
- ✓ Costs of organization and training relative to those of surveys
- ✓ Number of successfully prepared interviewers, test result
- ✓ Number of corrections to addresses
- ✓ Number of the forms of communication and channels aimed at providing preliminary information for data suppliers
- ✓ Cost of the individual questionnaires
- ✓ Are all teaching materials available?

4.3 Run Collection

This sub-process is where the collection is implemented. The different collection instruments are used to collect or gather the information which may include raw microdata or aggregates produced at the source, as well as any associated metadata. It can include the initial contact with providers and any subsequent follow-up or reminder actions. It may include manual data entry at the point of contact, or fieldwork management, depending on the source and collection mode. It records when and how providers were contacted, and whether they have responded. Depending on the geographical frame and the technology used, geo-coding 1 may need to be done at the same time as collection of the data by using inputs from GPS systems, putting a mark on a map, etc. This sub-process also includes the management of the providers involved in the current collection, ensuring that the relationship between the statistical organisation and data providers remains positive, and recording and responding to comments, queries and complaints. Proper communication with reporting units and minimisation of the number of non-respondents contribute significantly to a higher quality of the collected data.

For administrative, geographical or other non-statistical data, the provider is either contacted to send the information or sends it as scheduled. This process may be time consuming and might require follow-ups to ensure that data are provided according to the agreements. In the case where the data are published under an Open Data license and exist in machine-readable form, they may be freely accessed and used.

This sub-process may also include the monitoring of data collection and making any necessary changes to improve data quality. This includes generating reports, visualising and adjusting the acquisition process to ensure the data are fit for use. When the collection meets its targets, it is closed and a report on the collection is produced. Some basic checks of the structure and integrity of the information received may take place within this sub-process, (e.g. checking that files are in the right format and contain the expected fields).

Quality guidelines

Use the appropriate technology to ensure the efficiency and quality of data collection.

Affecting data quality immensely, data collection is often the costliest part of surveys. The rapid development of communication technologies and IT systems open up new possibilities of cutting down cost while improving data security and reliability and accelerate access to data. Computer-assisted data collection techniques are good examples of the new approaches drawing on the benefits of existing technologies (CASI, CAPI, CATI, etc.).

Efforts should be made to rely on electronic data collection as much as possible. Its advantages are that

- Data are recorded and captured simultaneously;
- Internal controls and skip logics can be embedded; there cannot be too much monitoring or control at the respondent level;
- Interviewers are easier to inspect;
- Data providers' burden can be reduced.

If data are collected electronically, data providers should be granted the possibility of completing questionnaires using their internal systems (book-keeping, invoicing and inventory records, etc. This requires a high level of harmonization because currently, not all statistical concepts (terms) correspond to those used in book-keeping; there are differences which are still estimated differently on the data provider's side. This was identified and corrected during the inspection of data providers.

***Efforts should be made to optimize willingness to* respond.**

Good practice capable of minimizing burden on data providers and, hence, improving the quality of the data.

Towards this end, respondent should be appropriately informed information, induced and motivated.

Collection should be adopted. Respondent friendly questionnaires must be compiled in a manner that takes completion time into account. The use of mixed mode data collection can also encourage willingness to respond by allowing respondents to choose the mode they prefer.

Efforts should be made to reduce burden on data providers.

Respondents must be satisfactorily informed on

- The objective of the data collection,
- The way in which data will be used,
- Whether filling out the questionnaire is mandatory or voluntary,
- Data protection and the security of the data provided,
- The manner in which the questionnaire can or may be filled out,

- The deadlines.

Local links and channels of intermediation (e.g. opinion leaders, the media, the police and local governments, “surfaces of presence”) where information materials (billboards, promotion materials and articles, etc.) can be provided may prove useful in data collection operations. Gifts to respondents may also prove useful.
At least one contact person should be allocated to institutional data collection (sending e-mail alerting to deadlines).
Reducing burden on data providers is one of the means that can improve the quality of data and, hence, statistical end-products.
Several means to be arranged and prepared prior data collection during the process of organization can be used for this purpose:

- When data providers are next visited, it is important that the information provided by them and capable of correcting erroneous data be available.
- Respondent-friendly questionnaires should be compiled.
- In the case of self-completion, an e-mail address or a telephone number to be used if difficulties are encountered must be provided in the letter of request or the questionnaire.
- In the case of web-based self-completion, the percentage value of completion must also be indicated.
- When designing questionnaires, it is important that their length is taken into account in accordance with the data collecting tool in question (CATI, CAPI, CAWI, etc).

The mode in which a questionnaire is completed should be selected by data providers (mixed mode data collection).

Information for data providers in the case of mixed mode data collection

In the case of mixed mode data collection satisfactory focus should be given on the information and motivation of data providers so that they can be aware of the possibility of selection and select the method that is the most advantageous from the perspective of the quality of data and with which they feel the most comfortable.

Mixed mode data collection should be used whenever possible.

The use of mixed mode data collection has a number of advantages to it which are meant to improve data quality. Besides leading to reduction in costs in the long run, mixed mode data collection is also likely to contribute to increased willingness to respond (Internet-based questionnaires are useful for those whom interviewers never find at home or who are unwilling to open the door to interviewers or who are unwilling to provide answers to interviewers).

Data providers should be allowed the possibility of contacting someone if they encounter difficulties during the data collection operation.

Data providers should be helped in every conceivable way to provide good quality data safely. Towards this end, information available at the website, a telephone-based call center (providing a toll free telephone number) and e-mail-based assistance should be provided. In the case of institutional data collection both professional and IT assistance is provided via a telephone-based call center (providing a toll free telephone number) and an e-mail-based Helpdesk. If data needs to be corrected or when questionnaires are completed, direct assistance should be provided by data processing statisticians for

data providers with whom a steady relationship based on mutual trust has evolved due to earlier data reporting. In the case of CAPI and CATI interviewers should be prepared for the related questions.

In the case of CAWI there should be a telephone number or an e-mail address via which problems can be reported or enquiries made. Remember to indicate the period when staff is available over the telephone.

Quality Dimension

- ✓ Managing respondent burden
- ✓ Accuracy and reliability
- ✓ Timeliness and punctuality

Possible quality indicators

- ✓ Quality control is used to manage the quality of data collection and data capture processes.
- ✓ Support is provided to respondents (e.g. toll free number).
- ✓ Are there enough staff responsible for dealing with the respondent's questions?
- ✓ Meaningful feedback is provided to interviewers and fieldworkers on a regular basis
- ✓ Monitoring of fieldwork operations is done during data collection.
- ✓ Interviewer performance is measured for CATI, CAPI, PAPI surveys (e.g. interviewers' productivity).
- ✓ Domain response rates; representatively indicators; achieved CVs of key variables in domains of interest
    - o A1. Sampling error – indicators
- ✓ Unit nonresponse rate; item nonresponse rate; proxy rate
    - o U A4. Unit nonresponse – rate
    - o A5. Item non-response - rate
- ✓ Mode effect when more than one collection mode
    - o Can only be assessed after estimation.
- ✓ Outgoing error rates; estimate of non-sampling error
- ✓ Delay between expected and actual start and close of collection
- ✓ Percentage of data transmitted according to the agreements with administrative data owners (e.g. format, time schedule)
- ✓ Response rate: number of respondents/sample members
- ✓ Rejection rate
- ✓ Item level non-responses
- ✓ Average length of interviews
- ✓ Proportion of proxy respondents

4.4 Finalise collection

This sub-process includes loading the collected data and metadata into a suitable electronic environment for further processing. It may include manual or automatic data capture, for example, using clerical staff or optical character recognition tools to extract information from paper questionnaires, or converting the formats of files or encoding the variables received from other organisations. It may also include analysis of the metadata and paradata associated with collection to ensure the collection activities have met requirements. In cases where there is a physical collection instrument, such as a paper questionnaire, which is not needed for further processing, this sub-process

manages the archiving of that material. When the collection instrument uses software such as an API or an app, this sub-process also includes the versioning and archiving of these.

Quality guidelines

Preparation of editing during data preparation

The most complex activities of data preparation are carried out by humans. Therefore, statistical quality control should be applied to manual editing, coding and data capturing.
A monitoring system should be established and, if necessary, corrections should be made.
In order to be able to control and oversee the data collection process, we need to establish a monitoring system, which enables those in charge of managing data collection to keep track of all address and questionnaires, their status and quality in the process of data collection in the case of population data collection. Procedural rules for control should also be laid down for institutional data. In the case of electronic surveys control should be performed simultaneously with data capturing.
In the case of institutional data collection, the collected data must be integrated into a single database for further statistical processing.
Owing to the complexity of data collections, not all controls can be performed on the side of data providers; currently, interconnections between major data tables and data collections are checked in the IST system along the specifications and the checkpoints provided.

Organizers should keep track of field work continuously by way of the IT system concerned. They should monitor events and the progress made by interviewers. They should be prepared for any eventuality in the interest of the documentation of experience and future use. Electronic questionnaires should be checked continuously and be performed in accordance with the steps determined in advance and the implementation order. (Checking incoming questionnaires: exceptionally high values, answers to open (Yes-No) questions, proportion and distribution of missing data; checking interviewers via data providers in person or by phone.)

In the case of institutional data collections, checks are guaranteed by observations incorporated into Elektra questionnaires on the data provider's side and an automatic error detection programme in the case of data uploaded into the ADÉL system. In the case of serious mistakes feedback on them can be provided automatically or as an error message by specialist statisticians subsequent to the highest level batch test run on the processing system. Automatic serious mistakes on the data provider's side are corrected immediately, those on the processing side – subsequent to discussions with data providers – are caused to be corrected or explained by statisticians.

In the course of the individual checks all detected errors should be documented and corrected. Those performing the checks should provide feedback to those arranging the surveys and the interviewers.

Based on the results of the checks: sanctioning and differentiation.

Performance- and quality-based remuneration could improve the quality of work.

Address visits should be accurately documented.

In order to ensure the accuracy of addresses the address registers should be documented as accurately as possible. In the long run, this can save time and efforts, which, in turn, improves the quality of data because sampling is based on an accurate register of addresses. Similarly, address registers must be maintained continuously.

Failures and non-responses should be treated and documented accurately.

It is important that failure codes and non-responses should be recorded accurately (by interviewers) and that addresses be maintained and address registered updated (by statisticians) during data collections. In the case of institutional data collections, it is important that causes of why questionnaires fail to arrive should be recorded. One reason for that is the assessment of surveys and the other is the determination of scope in the periods to come.
Efforts should be made at the alignment of failure codes because such could improve the comparability of surveys and the alignment of financial settlements.

Reducing the number of the errors materializing during data capturing.

A feasible solution to reducing the number of the errors materializing during data capturing is computer (CAPI and CATI, etc.-aided surveys) i.e. electronic data collections (CASI). In this case corrections can be made during data collection. Internal audits pointing out internal inconsistencies and mistypes to interviewers should be embedded in the checked.

In the case of institutional data collections, in respect of "own check" the data provided by the data providers (by way of Elektra) during the data collection operations for which they are responsible and uploaded into the ADÉL system by running the highest level batch error monitoring programme; **they** check data on the level of data providers, **provide** feedback on errors to those submitting the data and cause errors to be corrected and explained. In the case of population data, internal inconsistencies must be identified, and if difficulties are encountered, data providers or interviewers must be contacted again.

Timely preparation of editing

Objective: utilization of experience for future surveys:

- Assessment of the work performed with the involvement of the participants; feedback meetings, workshops with the involvement of organizers, interviewers, respondents and the staff in charge of data capturing (scenarios, protocols and attendance sheets);
- Documenting and archiving the results of data collections;
- Reports reflecting quality, weekly, monthly, periodical and end-of-the year closing reports, production of indicators: quality reports;
- Respondent satisfaction analyses;
- Documenting, evaluation and utilization of the errors identified in the course of analyzing data in the questionnaires recorded;
- Validation;
- Measuring user satisfaction.

Checking data collections preparation of documentation upon the evaluation and closing of the work

Editing is often a complex process. Therefore, detailed and up-to-date procedures, along with the appropriate training, should be applied to those participating in the control of work.
Lessons should be learnt from editing and in order to reduce the number of the errors, we should prefer prevention rather than end-of-the pipe reactions. That is, prevention should take priority over error correction (questionnaire planning, guide to completion etc.). Towards this end, editing should be one

of the first things to do in surveys, especially if respondents are still available, as is the case of CAPI, CATI methods.

Upon closing data and interviewers must be checked in accordance with pre-determined steps (e.g. the number of the interviewers and questionnaires, the questions aimed to check interviewers posed to data providers).

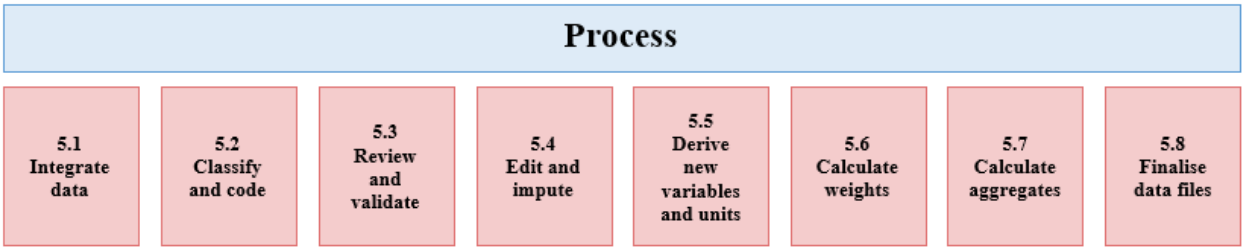
Quality Dimension

- ✓ Cost effectiveness
- ✓ Accuracy and reliability

Possible quality indicators

- ✓ Discrepancy between planned versus actual collection costs;
- ✓ Percentage of collection activities that met requirements (assessed through analysis of paradata);
- ✓ Outgoing error rates; estimate of no sampling error;
- ✓ The rate of over-coverage: The proportion of units accessible via the frame that do not belong to the target population (are out-of-scope). The rate of over-coverage is applicable:
  - o to all statistical processes (including use of administrative sources);
  - o to producers.
- ✓ Number and type of corrections during data capturing;
- ✓ Number of ex post corrections.

5. Process phase



This phase describes the processing of input data and their preparation for analysis. It is made up of sub-processes that integrate, classify, check, clean, and transform input data, so that they can be analysed and disseminated as statistical outputs. For statistical outputs produced regularly, this phase occurs in each iteration. The sub-processes in this phase can apply to data from both statistical and non-statistical sources (with the possible exception of sub-process 5.6 (Calculate weights), which is usually specific to survey data).

The "Process" and "Analyse" phases can be iterative and parallel. Analysis can reveal a broader understanding of the data, which might make it apparent that additional processing is needed. Sometimes the estimates being processed might be already published aggregates (undertaken according to a Revision Policy).

Activities within the "Process" and "Analyse" phases may also commence before the "Collect" phase is completed. This enables the compilation of provisional results where timeliness is an important concern for users, and increases the time available for analysis.

The “Process” phase is broken down into eight sub-processes (schema above), which may be sequential, from left to right, but can also occur in parallel, and can be iterative. These sub-processes are:

5.1 Integrate data

This sub-process integrates data from one or more sources. It is where the results of sub-processes in the "Collect" phase are combined. The input data can be from a mixture of external or internal sources, and a variety of the collection instruments, including extracts of administrative and other non-statistical data sources. Administrative data or other non-statistical sources of data can substitute for all or some of the variables directly collected from survey. This sub-process also includes harmonising or creating new figures that agree between sources of data. The result is a set of linked data. Data integration can include:

- Combining data from multiple sources, as part of the creation of integrated statistics such as national accounts;
- Combining geospatial data and statistical data or other non-statistical data;
- Data pooling, with the aim of increasing the effective number of observations of some phenomena;
- Matching or record linkage routines, with the aim of linking micro or macro data from different sources;
- Data fusion - integration followed by reduction or replacement;
- Prioritising, when two or more sources contain data for the same variable, with potentially different values.

Data integration may take place at any point in this phase, before or after any of the other sub-processes. There may also be several instances of data integration in any statistical business process. Following integration, depending on data protection requirements, data may be de-identified, that is stripped of identifiers such as name and address, to help to protect confidentiality.

In surveys in which some data sources are used, these data sources should be integrated and prepared in order to enable further statistical processing. In terms of registered resources and variables recorded in them, data from various sources are integrated through defined identifiers. Integrated data is stored in the production database. Any reported data or data obtained from an administrative source must be provided with a variable changeable status. A list of process units that cannot be integrated is prepared. These units are then integrated on the basis of other content-related guidelines or a procedure for their integration.

Quality guidelines

As a first step, specifications have to be laid down for the integrated datasets.

By setting our goals, we decide on the variables on which we will focus during data integration. There is a difference between a situation where we link data for the purposes of e.g. research, analyses or methodological development or for a temporary period and the situation where we wish to create a database which is the data source of official statistics.

Close attention must be paid to data quality control in respect of data integrated or to be integrated.

The quality of secondary data must be checked from form-related perspectives and along logical correlations. We must check whether the proper logical correlations exist within one single record or the entire data file. E.g. administrative data sources may sometimes be obsolete. Institutions providing administrative data must be notified of errors occurred by way of reminding them of their having to make efforts to avoid similar errors in the future. It is important that analyses and estimates from integrated datasets should be as accurate as possible.

Efforts should be made to render datasets linkable.

It is important that secondary data be available in a format suitable for being linked and, if possible, each furnished with a uniform unique identifier. In the case of administrative data sources it is sometimes the case that e.g. id numbers are missing. Another source of difficulty is when e.g. available addresses are in differing formats. It is easier to link data from various surveys with a higher degree of accuracy if questions aimed at receiving certain data are consistent, i.e. the same questions are asked.

Data to be integrated must be prioritized in a manner that takes data quality and how satisfied the proper correlation between variables into account.

If the value of a variable pertaining to a single statistical case is available in more than one data source and these values are different, we need to decide on the data source whose variable we wish to accept. Priorities must be adhered to consistently, and attention should also be paid to the consistency of the data belonging to the same record.

We should use reliably functioning methods to integrate data.
Internationally adopted methods should be preferred.

Use reliable tested software.
Use internationally adopted software or test internally

Document all the operations carried out during integration.

Alterations to original datasets must be documented. This is also required for the availability of all necessary and available information on data quality

If possible, the errors identified during data integration should be used in both the integrated and the original datasets.

This step also helps to improve quality of original data.

If the accuracy of data is called into question, use further data sources during data integration.

E.g. public data available on corporations and entities on the Net can also be used.

Based on feedback on the accuracy on data in integrated datasets, datasets should be modified.

If e.g. address registers are updated on the basis of administrative data, information on the cases where questionnaires failed to delivered should also be used. In the case of preliminary data and estimates, revisions should be based on data clarified later.

All data integration tasks must be carried out in accordance with data protection rules.
We must be familiar with the applicable data protection laws. We should also remember that the linking of two datasets carries further disclosure risks.

The number of the errors during data capturing must be reduced.

A feasible solution to reducing the number of the errors materializing during data capturing is computer (CAPI and CATI,) i.e. computer assisted data collections (CASI). In this case corrections can be made during data collection. Internal checks pointing out internal inconsistencies and mistypes to interviewers should be embedded in the process.

Data capturing must performed accurately.

Provision of the technical conditions (quality hardware and Testing of data capturing programs). Documenting the errors identified and corrected during data capturing by means of pre-defined error list (separation of the producer database from the user database). Monitoring data capturing (current status of work).

Accordance provided in advance with criteria

The interviewers and questionnaires, the questions aimed to check interviewers posed to data providers).

Documentation upon the evaluation and closing of the work

Objective: utilization of experience for future surveys:

- Assessment of the work performed with the involvement of the participants; feedback meetings, workshops with the involvement of organizers, interviewers, respondents and the staff in charge of data capturing (scenarios, protocols and attendance sheets);
- Documenting and archiving the results of data collections;
- Reports reflecting quality, weekly, monthly, periodical and end-of-the year closing reports, production of indicators;
- Quality reports;
- Respondent satisfaction analysis;
- Documenting, evaluation and utilization of the errors identified in the course of analyzing data in the questionnaires recorded.

Quality dimension

- ✓ Methodological soundness
- ✓ Accuracy and reliability

Possible quality indicators

- ✓ ESS QPI - A3. Common units - proportion
- ✓ Number and type of corrections during data capturing

5.2 Classify and code

This sub-process classifies and codes the input data. For example, automatic (or clerical) coding routines may assign numeric codes to text responses according to a pre-determined statistical classification to facilitate data capture and processing. Some questions have coded response categories on the questionnaires or administrative source of data, others are coded after collection using an automated process (which may apply machine learning techniques) or an interactive, manual process.

Quality guidelines

When selecting coding methods, it is important that close attention be paid to the accuracy of data, the costs incurred and timeliness.

In order to be able to select the optimal solution from among options like paper-based coding, computer-aided coding performed by experts and automatic coding, we need to test the various methods available. It is important to remember that – in the case of paper based data collection – the cost of recording open-ended questions incur additional costs to those of computer-assisted coding; however, the texts thus recorded can be used in the future as well.

Coding must be planned in advance.
In the case of manual coding the coding staff must receive consistent (uniform) training.

The coding plan should include scheduling, the requisite human resources and any other emerging costs.
It is important that each member of the coding staff should have identical knowledge in respect of both questionnaires and classifications. Equally important, if new office directives are issued during coding – based on quality controls – they must be communicated to all members of the staff.

In the case of computer- assisted manual coding, editing rules should be embedded into coding.
The algorithm of the automatic coding must be checked for efficiency and accuracy.

Control rules (e.g. validity of codes, logical connections) help coding staff to identify mistypes (in the case of lists, selection errors) already during coding; furthermore, they also accelerate editing.
The testing of accuracy must be performed by experts, who, using a sample, check the reliability of the values coded by the algorithm.

Code dictionaries used for coding and additions to such dictionaries must be approved by acknowledge experts in the area.

Coding can be regarded to be a self-study process. Coding an increasing number of textual fields contributes to additions to coding dictionaries, which, in turn, makes both automatic coding and coding performed by experts more efficient. It is equally important that only elements approved by experts be included in dictionaries.

The accuracy of coding must be checked at all times.

The checking of accuracy, ultimately quality control, must be performed on random samples. It is important that – in the case of manual coding – checking should cover all members of the coding staff

and, in the case of automatic coding, each instance of addition to dictionaries or each algorithm modification. Checking must be performed independently by the best coding staff of the specific area.

Coding staff must provide feedback on the results of the quality control performed on coding.

A summary of frequent errors can be good practice and is a good source of information for all members of the coding staff.

Quality dimension

- ✓ Methodological soundness
- ✓ Accuracy and reliability
- ✓ Timeliness and punctuality

Possible quality indicators

- ✓ Compliance rate of classifications of input data to the pre-determined standard international classification and national versions of international classification scheme
- ✓ Compliance rate of coding of input data to the pre-determined standard coding scheme. Ratio of coding according to various methods = number of records coded by means of a given procedure/total number of coded records.
- ✓ Ratio between the number of values automatically coded and the total number of values submitted to coding.
- ✓ Proportion of statistical units which cannot clearly be classified or mapped.
- ✓ Delay between expected and actual timing of adaptation of correspondence tables.
- ✓ Ratio of erroneously coded records = number of erroneously coded records/total number of coded records.
- ✓ Nomenclature.

5.3 Review and validate

This sub-process examines data to identify potential problems, errors and discrepancies such as outliers, item non-response and miscoding. It can also be referred to as input data validation. It may be run iteratively, validating data against pre-defined edit rules, usually in a set order. It may flag data for automatic or manual inspection or editing. Reviewing and validating can apply to data from any type of source, before and after integration, as well as imputed data from sub-process 5.4 (Edit and impute). Whilst validation is treated as part of the "Process" phase, in practice, some elements of validation may occur alongside collection activities, particularly for modes such as computer assisted collection. Whilst this sub-process is concerned with detection and localisation of actual or potential errors, any correction activities that actually change the data is done in sub-process 5.4 (Edit and impute)

Prior to the integration of administrative resources it is necessary to clean up all the resources and decide whether they contain errors that could stop integration. In the first step, based on defined controls, errors are detected and printed. In the second step based on the content of the instructions, manual or automatic corrections apply. If the data are problematic (inappropriate), the institution that sent the information is required to retransmit the data.

Regarding the data level, editing procedures can generally be divided into micro and macro editing data. In processing data at micro level, the procedures are implemented at the level of individual units, ie. at the level of microdata. Data conversion at micro level varies depending on the method of data

collection, terrain or observation via (telephone, paper questionnaire (data jumble through optical reading).

In surveys conducted on the field with laptops, logical checks are applied during the interview. After interviewing, the data are integrated into a common file, where necessary, detected errors are corrected manually or automatically.

In surveys with paper questionnaires, after rapid casting and capture of errors through optical readers, logical checks should be implemented. The detected errors are corrected manually or automatically.
Macro Editing - In a narrower perspective, editing at the macro level means identifying and localizing errors in the aggregated data already. If by mistake or a dubious data value at macro level data is detected, it should be checked and, if necessary, corrected at the micro level.

Quality guidelines for validation

The validity of recorded data must be checked.

A validity check must be performed on possible ranges, code values and nomenclatures. Outliers, intervals, data correlation (within and between records and among files) and the parent-child relationships between the individual files must be examined and checked (as per the identifiers provided).

Control criteria must be laid down already during the planning of data collection.

Correlation between the individual data must be taken into account already during planning.

The scope and range of the checks performed must be revised periodically.

The objectives of check rules and specifications are to ensure data consistency and to monitor the quality of data collection. Systemic errors are especially useful from this point of view because they are likely to identify such questions in the questionnaires that are harder to interpret.

The consistency of indicators with identical contents from various statistics must be ensured.

Data comparison requires substantial expertise and circumspection because automatic comparison does not work or only partially does so.
Differences between concepts and nomenclatures must be checked separately for each indicator. Data can be compared with differences between concepts and nomenclatures borne in mind.
When consistency checks are scheduled, attention must be paid to the deadlines set in respect of final data production regarding other data collection at the office.

In order to use data and information sources in sufficient number and quality, all statistics and all administrative data sources available at the time must be used for meso validation.

In the interest of the most reliable and accurate data possible, the largest possible number of data sources must be used.
Data maps show comparable indicators and their quality.
In the case of intra-year (monthly, quarterly) sales data we also use, e.g. VAT data. For annual indicators we also use E-reports and corporate tax databases.

It is sometimes the case during the examination of the possible causes of inconsistencies that certain (data or textual) information can only be found in the notes or annexes from which it must be manually retrieved.

Methods of comparison should always be selected or adopted in accordance with the relevant purposes.

When new control is to be performed, the primary goal and the methods of the control should be set in a manner ensures that the control to be performed is efficient and is able to explore the largest possible number of inconsistencies.
For instance, when comparing intra-year and annual export sales, it is important that differences arising from exchange rate changes be taken into consideration.
E.g. when product-level export data in industrial statistics are compared with foreign trade product export data, first the two NACE classifications must be reconciled using the CN-CPA conversion table.

Errors explored during validation must be corrected at a micro-level and all data thus modified must be tagged.

Errors identified during or after processing are all corrected at a micro-level. The objective is that existing processes receive feedback on the results and experience and, as a result, more consistent data can be generate already in the first phases of processing.

Decision on whether or not published statistics based on earlier data should be revised – on the basis of the revision policy.

Quality Dimension

- ✓ Accuracy and reliability

Possible quality indicators

- ✓ Rate of actual errors: Identification of incorrect data (actual errors) in the processing stage - missing, invalid or inconsistent entries or that point out data records that are actually in error.

5.4 Edit and Impute

Where data are considered incorrect, missing, unreliable or outdated, new values may be inserted or outdated data may be removed in this sub-process. The terms editing and imputation cover a variety of methods to do this, often using a rule-based approach. Specific steps typically include:

- Determining whether to add or change data;
- Selecting the method to be used;
- Adding/changing data values;
- Writing the new data values back to the data set, and flagging them as changed;
- Producing metadata on the editing and imputation process.

In more detailed, specific steps include:

- ✓ Determining what the given should be added and changed.
- ✓ Selection of the imputation method.
    - Adding or changing the data.

- Adding new values to the datasets and marking them with an additional variable.

✓ Produce quality indicators related to imputation and editing.

✓ With appropriate statistical methods, we estimate the data we were unable to obtain at the data collection stage (the missing data). There are many imputation methods, but basically they can be divided into two groups:
  - Deterministic Methods: The predicted value is calculated by an analytical procedure using the proper deterministic function.
  - Stochastic Methods: The calculation procedure for estimates for missing values is based on the procedure using a probabilistic mechanism.

Edit

Quality guidelines for editing

Editing must be prepared in advance.

Editing is often a complex process. Therefore, we must apply up-to-date procedures and hold appropriate training for all who participate in the editing process.

Lessons should be learnt from editing and in order to reduce the number of the errors, we should prefer prevention rather than end-of-the pipe reactions. That is, prevention should take priority over error correction (questionnaire planning, guide to completion etc.). Towards this end, editing should be implemented in the phase when respondents are still available, as is the case of CAPI-, CATI- and CASI-type methods.
In the case of computer-assisted self-completion (CASI), fundamental checkings that can be performed in the questionnaires themselves should occur on the data provider's side in the case of both population and institutional data collections.

Over-correction should be avoided. Let's not fall into the trap of what is called creative editing.

The usefulness of editing may prove limited and the process may even turn out to be counter-productive. Over editing may lead to a point where the same number of errors are entered into the system as have been removed. Therefore, over-correction is to be avoided. Over editing means that the person who plans editing asserts his own ideas in respect of the data edited and distorts the validity of the conclusions that can be drawn from the results. Clarification of the errors identified during processing, correction of errors discussed with and agreed upon with data providers before data closures and explanations may help avoid over-correction and provide a true picture of the current situation. Thus there are appropriate explanations and reasoning arguments underpinning difference in variables.

Each step of editing must be documented and performed in a manner that ensures irretrievability.

Differences between received and edited data can be examined with satisfactory circumspection only if both versions are available and we have clear information on how the final data have been created.

The process should be uniform and transparent for all participants.

The process should be rendered uniform and consistent for all participants and as free from errors as such is reasonably possible. A group of experts may also be involved providing assistance with addressing complicated cases. Another advantageous solution is the centralization of data preparation if such can reduce costs and simplify the utilization of expertise.

Set great store by the significance of errors and respondents.

In the course of editing the proportions of remarks indicating actual errors is generally very low. Furthermore, the impact of errors can be very different.

The importance of systemic errors must be taken into account.

In other words, it is not unusual that only a few errors are accountable for the majority of changes. If we focus on these errors during editing and abandon the idea of correcting more specific ones, the quality of data will not deteriorate significantly. Error priorities can be based on the type and frequency of errors and the significance of the variable concerned.

Efforts should be made to focus on detecting and managing systemic errors, which can lead to major distortions, however, can be easily explored and managed (even automatically). Such errors include, e.g. measuring errors, mistypes, erroneous signs and rounding errors.

Keeping manual minimum

As manual editing is not a cost and time efficient method, it should be applied only to a small number of records, mainly to serious and/or critical errors. Inherent dangers are over or creative editing.

Use automated procedures.

Editing is perhaps the most labour consuming part of data processing taking up considerable amounts of time. If there are time constraints, a balance should be struck between very careful correction and speed. Towards this end, automated procedures capable to identify errors of varying importance with satisfactory reliability and, if necessary, correct them should be used and only in highly justified cases should expert intervention be resorted to.

Efforts should be made to reduce burden on data providers.

One of the objectives of editing is to exclude the lowest possible number of respondents from analyses. At the same time, however, attention should also be paid to the importance of reducing respondent burden.

In the course of editing, the level of control and the types of errors must also be taken into account.

Different (informative, acceptable, serious and critical) categories of errors call for different steps of editing.

Feedback on the results of editing should be incorporated into the planning phase of questionnaires.

Conclusions drawn from the results of editing can help to improve the structure of questionnaires, which, in turn, improves the efficiency of analyses.

Conclusions drawn from editing should be used.

By doing so, we can provide detailed information on the quality of surveys.

The (time, cost and resource) limits of editing should be taken into consideration.

As deadlines are increasingly tight, we should strive to optimize editing.

Impute
Quality guidelines for imputation

Distinction must be made between the types of missing values.

Although the simplest representation of the absence of data is the value NULL, it does not necessarily describe it accurately. Therefore, clear distinction must be made between

- zero,
- missing values and logically impossible data.

In the absence of such distinction we may easily take values into account that we should not or miss actual genuine values, which leads to inaccurate distorted estimates.

The cause of the absence of data must be analyzed.

Before imputation, we need to explore the structure of data absence: we need to identify respondents and the variables where data absence emerges and frequency. Such analyses help arrange the procedure of imputing data (identify the variable where we should start the process) and classify respondents in homogeneous groups as per the data missing.

When selecting a method for imputation, it is important that the characteristics of the model are carefully checked.

Imputing data is always modeling: our ideas about data, changes in them and their absence.

Attention must be paid to correlation between data in the course of imputation.

Imputation is expected to produce results close to genuine answers. One of the requirements is that the data thus supplied should not be at variance with genuine answers.

Imputed data should be tagged.

The impact of imputing can be monitored and evaluated only if we can separate the imputed values and from the original values. This can be particularly important in the case of panel surveys because the repeated use of imputed values may distort results significantly while it denotes a stable status where in fact we do not know what has happened.

Imputing should be restricted to the lowest possible level.

Imputation should be provided at the lowest level of answers if possible and appropriate. Thus the summary questions of questionnaires and/or generated variables (total turnover, total income) can be produced in the same manner as in the case of complete questionnaires. In this manner we can also produce conflict-free questionnaires. The drawback to a procedure like this is that substitution may include several steps.

We should simulate the procedure and test it on respondents

The efficiency and impacts of imputing are hard to measure accurately because often the missing answers cannot be imputed. Therefore, when establishing an imputation procedure, it is important that non-responses approximating reality be simulated among respondent and impute such artificial missing data. In that way we can test the procedure robustly and obtain a picture of its impacts and can compare the results, advantages and disadvantages of the individual imputing operations.

There is no final list of imputing methods.

The selection of the right imputation procedure depends on a number of factors:

- Absence of data,
- The nature of the variables to be imputed,
- The available IT equipment,
- Knowledge, expertise
- Time.

Procedures aimed at imputing data can be grouped according to their characteristics. A number of aspects can be considered in the working out of the method.

The uncertainty carried by imputing should be taken into consideration when estimates are made.

Models used in procedures aimed at imputing missing data are always imperfect because, generally speaking, we cannot incorporate all the elements into the procedure that have produced the results. Therefore, the procedure itself should be one that can take the variety of possible values into consideration, i.e. it contains some stochastic element ($+\varepsilon$).

Imputing methods must be revising at regular intervals.

Imputation procedures can provide optimal answers only in respect of certain data and only in certain periods. The characteristics of the observed populations may change over time, i.e. the model that is valid at the time when the imputation procedure is worked out may become obsolete and the tools at our disposal may also change. Therefore, it stands to reason that the imputation procedures be revised from time to time and, if necessary, replace them with more accurate and more appropriate ones in accordance with the new circumstances.

Subsequent to imputation data should be checked in accordance with the editing rules applied earlier.

When imputation is over, the necessary checks must be repeated.

Quality dimension: Edit and Impute

- ✓ Accuracy and reliability

Possible quality indicators

Editing

- ✓ An indicator of an edit's effectiveness would be the rate of false negative or false positive assessments.
- ✓ Modification rates: number of modified records/total number of records (in data files)
- ✓ Modification rates can also be calculated in respect of observation units.

- ✓ Deletion rates: number of deleted values/total number of records (in data files)
- ✓ Proportion of unmodified empty cells: number of unmodified empty cells/total number of records
- ✓ Ratio of unmodified values: number of unmodified cells with answers/total number of records
- ✓ Rate of robustness of outliers for key variables
  - Robustness of Outliers = Corrected/Discarded Outliers / Total detected outliers (This indicator will measure the quality of an outlier detection process)
- ✓ Proportion of units with conflicting information

Imputation

Often, indicators characterizing imputed values rather than those typical of process quality are included in quality indicators.

- ✓ Imputation rate
  - The indicator is expressed as the ratio of the number of replaced values to the total number of values for a given variable.
  - The imputation rate is applicable:
    - to all statistical processes (with micro data (e.g. direct data collection and administrative data);
    - to producers.
- ✓ Proportion of missing answers subsequent to the imputation
- ✓ Extent to which administrative data was used for imputation.
- ✓ Proportion of imputed answers ex post failing to conform to control criteria
- ✓ Forecast accuracy: distance between actual and imputed values during testing (such slightly unclear wording is deliberate for it depends on the imputed variable):
  - discrete variables: some degree of classification accuracy (accuracy of classification or variance in the likelihood of classification)
  - continuous variables: residual variance (excluding the issue of homoscedasticity)

5.5 Derive new variables and units

This sub-process derives data for variables and units that are not explicitly provided in the collection, but are needed to deliver the required outputs. It derives new variables by applying arithmetic formulae to one or more of the variables that are already present in the dataset, or applying different model assumptions. This activity may need to be iterative, as some derived variables may themselves be based on other derived variables. It is therefore important to ensure that variables are derived in the correct order. New units may be derived by aggregating or splitting data for collection units, or by various other estimation methods. Examples include deriving households where the collection units are persons or enterprises where the collection units are legal units.

Quality guidelines

The algorithm, procedure or rule pertaining to indicator generation should be valid, meaningful and compliant with user needs.

It must be checked whether generated indicators have been generated in accordance with pre-determined algorithms, procedures or rules.
It must be checked whether generated indicators conform to pre-formulated hypotheses.

One such hypothesis is that the generated indicator is valid, satisfactorily meaningful, compliant with user needs, consistent, free from conflicts, topical, available, up-to-date and can respond to changes in the phenomena studied fast and reliably.

Generated indicators must be evaluated and validated. Efforts should be made to use internationally accepted standard indicators.

When indicators/variables are selected, the starting point should be internationally accepted standardized indicators to ensure the comparability and integration of data.

In the absence of official standards or in the case of different needs, the related needs must be examined.

If substitute indicators are used, the difference between the two indicators/variables must be documented and measured.

Quality dimension

- ✓ Accuracy and reliability
- ✓ Coherence and comparability

Possible quality indicators

- ✓ Calculations deviating from algorithms
- ✓ Deviation from the original hypothesis
- ✓ Accurate reference to standards
- ✓ Documenting and measuring deviations from standards
- ✓ Rate of comparability for derived variables

5.6 Calculate weights

This sub-process creates weights for unit data records according to the methodology developed in sub-process 2.5 (Design processing and analysis). For example, weights can be used to "gross-up" data to make them representative of the target population (e.g. for sample surveys or extracts of scanner data), or to adjust for non-response in total enumerations. In other situations, variables may need weighting for normalisation purposes. It may also include weight correction for benchmarking indicators (e.g. known population totals).

An appropriate weight is calculated for each unit that reported its data. Weight is calculated for various reasons: unequal probability of selection, non-response, regulation of population values. The weighing procedure is determined by the sample model and the auxiliary population variables available. In cases where weight is not required, each unit is given a weight 1.

Quality guidelines

Generally speaking, each step of weighting should be characterized by efforts at accurate estimates (dimensions: bias and variance) and commitment to targets.

- The design weight (selection probability) of each element of the selected sample depends on sample design and selection scheme. This weight has to be calculated in each case.

- Typically, design weight is not suitable for making estimates for populations. However, it can (and must) be used for e.g. frame quality examinations and non-response rate calculations.
- Design weight has to undergo multiple modifications before it is suitable for estimation. All modifications (e.g. non-response adjustment, calibration) must be made so that the mean squared error of estimates calculated with the final weight is minimal (in practice this means minimum bias and the lowest possible variance).
- It should be noted that in a number of cases weighting and/or estimation by weighted sum corresponds to known estimators. In this sense an estimator must be selected that is unbiased (or minimum biased or asymptotically unbiased) and has minimum variance.
- All interim weights are suitable for some analysis. We should use them in order to learn the characteristics of (realized) samples and the impact of the individual steps of weighting.

Only one weight should be used if possible.

In the case of multiple purpose surveys, it may be the case that different weights can make optimal estimates for different variables. In such cases we can create different weights depending on the target variable. In justified cases this is acceptable; however, we need to remember that estimates do not necessarily form a consistent system.

We should map information suitable for non-response adjustments (if adjusted by weighting).

- The more information we have the better chance we stand of non-response adjustments efficiently. Basically, this step is important because it is here that bias due to non-response can be reduced.
- If we have information on each element of the selected sample, response probability can be modeled already at an elementary level. (A typical example of this is modeling panel attrition in longitudinal surveys.) Creating homogeneous respondent groups can also model response propensity.
- A likely solution is calibration when we only have information on the elements of the realized sample and the whole of the (sub-) population.
- Variables correlated with target variables should be used as explanatory variables if non-responses are not simple random events (which are typically the case).
- Subsequent to this step, estimates only remain unbiased if the non-response model applied is accurate.

If auxiliary variables related to target variables and their known population totals are available, calibration is recommended because of its impact on reducing variance and bias.

- In specific cases calibration comprises the technique of post stratification, ratio estimation and regression estimation.
- We need to remember that by using it we lose theoretical unbiasedness.
- It is important that variables used for calibration and constraints should be coherent and population counts timely.
- Calibration constraints for surveys of identical target populations should not be conflicting if we wish to ensure comparability.

Interim weights and the extent of weight modifications may have to be limited in certain cases.

- Both non-response adjustment and calibration may cause significant modification of design weight. The latter may even lead to negative weights. This deteriorates the analyzability of samples.
- Weights or changes relative to design weights can be limited. This may require making a compromise between calibration constraints and weight limits.

In the case of a rotation, when a cross-sectional weight is applied to a given period, efforts should be made to the application of the longitudinal approach.

- If the samples of two successive periods overlap significantly, we can perform weighting in the course of which the variables and estimates of the previous period appear as e.g. calibrating variables or population counts.

If target variables with skewed distribution and/or outliers are available, we can also use robust estimators and outlier weights.

- The individual steps of weighting should be tested on survey samples and/or censuses or other databases as a result of which we can familiarize ourselves with them and with possibilities.
- E.g. by comparing the results of potential non-response adjustment, recommendations (best practice) for an entire field can be made.
- The impact of weight limits on estimation and its variance can be analyzed.

If possible, various weighting techniques, applied auxiliary information and parameters should be comprehensively tested.

The impact of different calibration constraints and the stability of estimates for target variables and, especially, its bias on the estimates of the variables not included in the constraints can also be analyzed

Weighting applied to estimates for same target populations and calibration constraints should be aligned with each other (e.g. in population samples the number of the population calculated by using cohort components, and in business samples current weights or design weights).

Estimates for sub-population not covered by observation.

Possible quality indicators

- ✓ The impact of the whole or certain elements of weighting (e.g. calibration) on reducing variance
- ✓ Impact of weighting on bias (typically difficult to measure)
- ✓ Impact of calibration on weights (an indicator showing the difference between calibrated weights and design weights adjusted for non-response)
- ✓ Time requirement of weighting
- ✓ Timeliness and completeness of population counts for weighting

Quality dimension

- ✓ Accuracy and reliability

Possible quality indicators

- ✓ The weights are adjusted for coverage and non-response error (yes/no indicator)

5.7 Calculate aggregates

This sub-process creates aggregate data and population totals from microdata or lower-level aggregates. It includes summing data for records sharing certain characteristics (e.g. aggregation of data by demographic or geographic classifications), determining measures of average and dispersion, and applying weights from sub-process 5.6 (Calculate weights) to derive appropriate totals. In the case of statistical outputs which use sample surveys, sampling errors corresponding to relevant aggregates may also be calculated in this sub-process.

Quality guidelines

Variance estimations should be made for at least the most important estimated indicator in major breakdowns. The same rules apply to them as for estimates in general. Use reliable and accurate variance estimators or procedures.

Accurate variance estimation takes into consideration all the impacts that influence the variance of the estimators:

- Sample design
- Estimator applied (weighting)
- Imputation
- Outlier treatment

If the estimates made with final weights are not reliable enough (typically for domains with a small sample size), we can make small area estimations.

It may sometimes the case that there is no variance estimator matching a complex sample design and/or weighting. In such cases re-sampling (e.g. bootstrap) or the simplification of the current design can help.
In the case of non-linear estimators (e.g. calibrated estimates) we should use linearization.
If we cannot make unbiased variance estimation, at least the direction of bias must be estimated. We should avoid downward biased variance estimations.

Estimates should constitute a consistent system.This pertains toconsistency between the estimates of one or more surveys. In the absence of such an explanation should be provided.

Temporal and spatial domain estimates should not be in contradiction with those for the "total".
There may be justified exceptions: e.g. the sum of domain estimates for totals made by using the technique of small area estimation is not necessarily equal to design-based estimates for the total.

Quality dimension

- ✓ Accuracy and reliability

Possible quality indicators

- ✓ Standard error or relative standard error of estimates for key indicators
- ✓ Bias (typically hard to measure)

- ✓ Sampling errors are applicable: i) to statistical processes based on probability samples or other sampling procedures allowing computation of such information. ii) - to users and producers, with different level of details given.
- ✓ The following indicators are proposed to analyze revisions:
    1. Mean Absolute Revision (MAR) is the average of absolute revisions over a time period (useful to analyze stability in terms of size).
    2. Relative Mean Absolute Revisions (RMAR) is the relative average of absolute revisions over a time period (useful for comparisons and to analyze levels.
    3. Mean Revision (MR) is the average of revisions over a time period (useful to analyze directions in terms of sign) and its significance (Yes/No).
- ✓ Standard Deviation of Revisions (SDR) is a measure of the variability of the revisions.
- ✓ Extent to which administrative data was used to create population benchmarks.
- ✓ Extent to which administrative data provided auxiliary information for estimators.
- ✓ Extent to which administrative data was used for revision.

5.8 Finalise data files

This sub-process brings together the results of the other sub-processes in this phase in a data file (usually macro-data), which is used as the input to the "Analyse" phase. Sometimes this may be an intermediate rather than a final file, particularly for business processes where there are strong time pressures, and a requirement to produce both preliminary and final estimates.

Quality guidelines

All data disclosures have to be made using the same database.

If we use more than one database, there may be differences in the data disclosed. In this case the detection of errors may mean significant extra work.

Before micro databases are finalized, all control rules must be applied. A database can be considered final if there are no errors in it.

In the case of mandatory rules there should not be any error in the database. If errors are detected, we need to return to the correction phase.

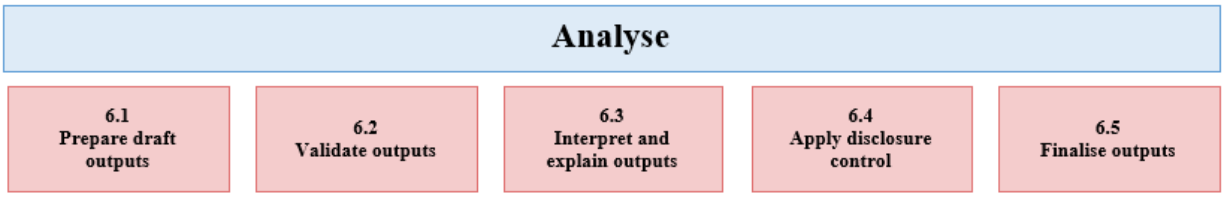
Quality dimension

- ✓ Timeliness and Punctuality

Possible quality indicators

- ✓ Delay between expected and actual finalized data file

6. Analyse phase



In this phase, statistical outputs are produced and examined in detail. It includes preparing statistical content (including commentary, technical notes, etc.), and ensuring outputs are “fit for purpose” prior to dissemination to users. This phase also includes the sub-processes and activities that enable statistical analysts to understand the data and the statistics produced. The outputs of this phase could also be used as an input to other sub-processes (e.g. analysis of new sources as input to the “Design” phase). For statistical outputs produced regularly, this phase occurs in every iteration. The "Analyse" phase and sub-processes are generic for all statistical outputs, regardless of how the data were sourced.

The "Analyse" phase is broken down into five sub-processes (schema above), which are generally sequential, from left to right, but can also occur in parallel, and can be iterative. These sub-processes are:

6.1 Prepare draft outputs

This sub-process is where the data from sub-processes 5.7 (Calculate aggregates) and 5.8 (Finalise data files) are transformed into statistical outputs such as indexes, seasonally adjusted statistics, e.g. trend, cycle, seasonal and irregular components, accessibility measures, etc., as well as the recording of quality characteristics such as coefficients of variation. The preparation of maps, GIS outputs and geo-statistical services can be included to maximise the value and capacity to analyse the statistical information.

Quality guidelines

Tabulated data should be generated automatically, whereby possible errors can be reduced.

If tabulated data are generated automatically from databases, such can reduce the number of possible copy-and-paste errors. Automatization can accelerate the time available for control. Automated tabulation must be tested.

Tables, charts and maps have to conform to the visual image of the office.

The data disclosed in databases must meet the form- and content-related requirements for systems.

The availability of all the concepts used in the published tables and databases must be checked. So must the fact be whether they meet both form- and content-related requirements

All indicators and concepts in data publications must be defined.

Definitions in foreign languages must contain the appropriate foreign language equivalents

In the case of multi-language publications the tables and methodological documents concerned must be translated.

Translations must be edited by native speaker revisers.

Quality dimension

- ✓ Soundness of implementation
- ✓ Accuracy and reliability
- ✓ Timeliness and punctuality

Possible quality indicators

- ✓ To what extent is the business process using standard or well-known methods (e.g. calculating indices, trends, seasonal adjustment)?
- ✓ Quality Control methods can be applied to ensure that the accuracy of the transformation process itself is sufficient. Indicators could be percentage of outputs reviewed (manually or automated), percentage of errors detected
- ✓ Did generation comply with plans?
- ✓ If the target of estimation is model based, provide the following:
    - Model assumptions and associated errors
    - Non-sampling error being treated or adjusted
    - For domain specific models, describe the model used and the assessment of validity of the data that had been undertaken.
- ✓ Model assumption errors are errors caused by models used. Models are based on assumptions (see Statistics Netherlands' reports).
- ✓ Model assumption errors occur with the use of methods, such as calibration, generalized regression estimator, calculation based on full scope or constant scope, benchmarking, seasonal adjustment and other models not included in the preceding accuracy components, in order to calculate statistics or indexes (see OECD Glossary).
- ✓ In case of model based seasonal adjustment, indicators include autocorrelation test, seasonal autocorrelation test, skewness, kurtosis and normality test for model residuals provides the opportunity of checking model assumptions satisfied such as Best Linear Unbiased Estimator.
- ✓ Another example of model-based estimation is Small Area Estimation, which is estimation of key variables for small domains. Sample diagnostics include Haussman test and residual based test depends on the model used
- ✓ Delay between the anticipated and actual completion of this step.

Seasonal adjustment

Quality guidelines

The seasonality of time series must be tested.

Seasonal effects are factors that affect time series to a closely identical extent in the same direction in the corresponding periods (quarters and months) of the various years. Impacts can be shown graphically and by way of statistical tests. Time series without seasonality must not be adjusted seasonally. In such cases, if necessary, original time series must be published as seasonally adjusted time series.

The calendar effect of time series must be tested unless, based on expert opinion, it can be evidenced that there is no such effect in the time series.

In case of calendar effects, fixed and non-fixed holidays, the Easter effect, the leap year effect and the working day effect must be checked. If there is no calendar effect, original time series must be published as calendar adjusted series.

Seasonal and/or calendar effect must be filtered from time series.

The objective of seasonal adjustments is to identify and remover seasonal fluctuations and calendar effects from time series in order that we can get a clearer picture of the characteristics to be studied. Seasonal adjustments are appropriately made if there is no seasonality or calendar effect left in the adjusted time series.

Various types of outliers in time series must be tested and documented in every case.

The management of extreme values (outliers) in time series affects the quality of seasonal adjustments to a large extent. Expert information must be taken into account during outlier setting, especially in the case where outliers are at the end of the time series and regularly statistically uncertain. Economic and social events and reasons underlying outliers must in all cases be documented.

When time series with close content links are adjusted, we must ensure that the results received are consistent.

In the case of time series with close content links efforts must be made at similar settings especially as regards aligned models, transformation, outliers and calendar effects.

For seasonal adjustments substantiated expert information available at the right time should be used and documented.

In order that results can be interpreted, it is important that expert information must be taken into account when the programme is set up. Substantiated information on seasonality, calendar effects, outliers, the explanation thereof and consistency is particularly important.

Trends, seasonally adjusted data and data adjusted for the calendar effect must be generated in a manner that they are consistent with each other.

The same method must be used for the calculation of trends and seasonally adjusted data. For instance, it cannot be achieved that the method used for the calculation of trends is different from that of seasonally adjusted data.

A direct method is used for the seasonal adjustment of aggregates.

Aggregates are adjusted separately by means of a direct procedure and the characteristics of the adjustment of sub-sectors are only taken into account in order for consistency to be ensured. Departure from this is allowed on the basis of sound professional reasoning.

Temporal consistency if required by users or rules can be ensured by means of internationally adopted recommended methods.

Basically, we do not provide temporal consistency between annual and seasonally adjusted intra-year data; however, in response to pressure from users or rules, it can be ensured by means of internationally adopted recommended methods.

Efforts must be made to keep the number of revisions at a relatively low while ensuring that the most possible information is included in the time series.

Data obtained during seasonal adjustments are all modified ex post as additional observations are added to time series. Efforts must be made at keeping the ex post modification of adjusted published data at a bare minimum. At the same time, however, attention should be paid that information loss is kept to a bare minimum. Towards this end, rules governing annual and intra-year recording of parameters must be complied with.

If so required, settings used for seasonal adjustments must be placed at the disposal of users.

Model and parameters setting may, if so required, be placed at the users' disposal.

During the application of the various procedures, ERS recommendations must be observed.

When applying the procedures, it is essential that the closest possible attention is paid to ESR recommendations on seasonal adjustments and the specific recommendations and requirements for the individual areas.

To ensure consistent seasonal adjustments, an office level policy should be adopted and regularly revised.

It is important that the internal rules of the office governing seasonal adjustments be laid down. Such document should include, inter alia, the procedural method, the software used, the details of the process, the principles pertaining the start-of-the year and intra-year recording of parameters as well as documentation, the frequency of trainings/further trainings, the revision policy as well as the publication of adjusted data and the methodology.

Possible quality indicators

- ✓ Tests on seasonality, calendar effects, outliers and model parameters, e.g. F-tests, t-tests
- ✓ Statistical tests on residuals (e.g. Ljung-Box, Box-Pierce statistics)
- ✓ Statistical tests on model alignment

6.2 Validate Outputs

This sub-process is where statisticians validate the quality of the outputs produced, in accordance with a general quality framework and with expectations. This sub-process includes activities involved with the gathering of intelligence, with the cumulative effect of building up a body of knowledge about a specific statistical domain. This knowledge is then applied to the current collection, in the current environment, to identify any divergence from expectations and to allow informed analyses. Validation activities can include:

- Checking that the population coverage and response rates are as required;
- Comparing the statistics with previous cycles (if applicable);
- Checking that the associated metadata, paradata and quality indicators are present and in line with expectations;
- Checking geospatial consistency of the data;
- Confronting the statistics against other relevant data (both internal and external);
- Investigating inconsistencies in the statistics;
- Performing macro editing;
- Validating the statistics against expectations and domain intelligence.

Quality guidelines

When comparison is made with data from other data sources, what needs to be checked is whether data are truly comparable with the data under survey.

When external sources are selected, differences in concepts and classifications must be thoroughly checked because it may be the case that differences are attributable to the fact that aggregate data are not comparable.

Validation requires the most accurate and reliable data sources.

In the interest of the most reliable and accurate data possible, the largest possible number of data sources must be used.

Methods of comparison should always be selected in accordance with the relevant purposes.

E.g. for temporal comparisons, using time series analyses as a tool, we need to use seasonally adjusted data for comparisons with data on earlier periods.

The reasons underlying errors must be identified and corrected at a micro-level.
Arguments found suspicious during or after processing are all corrected at a micro-level. Inconsistencies explored during the compilation of the national accounts are likely to suggest methodological or competence deficiencies, which we have to treat as a whole.

Quality dimension

- ✓ Accuracy and reliability
- ✓ Coherence and comparability

Possible quality indicators

- ✓ Proportion of overall budget dedicated to validation activities; number of validation measures applied
- ✓ As an example of validation measure the indicator "Asymmetry for mirror flows statistics" can be calculated (QPI- CC1. Asymmetry for mirror flows statistics - coefficient)
- ✓ Number or amount of changes made to the data based on validation results
- ✓ Availability of backcasting procedures where there is a break in the series
- ✓ Degree of coherence with other sources, with provisional data, with quick estimates, and with previous results of the same process
- ✓ Number of criteria for validation, absolute and relative deviation values, rate of interval errors (per item)

6.3 Interpret and explain outputs

This sub-process is where the in-depth understanding of the outputs is gained by statisticians. They use that understanding to interpret and explain the statistics by assessing how well the statistics reflect their initial expectations, viewing the statistics from all perspectives using different tools and media, and carrying out in-depth statistical analyses such as time-series analysis, consistency and comparability analysis, revision analysis (analysis of the differences between preliminary and revised estimates), analysis of asymmetries (discrepancies in mirror statistics), etc.

Quality Dimension

- ✓ Accuracy and reliability

Possible quality indicators

- ✓ Proportion of total budget dedicated to interpretation and explanation activities; extent to which a report is produced and accepted

6.4 Apply disclosure control

This sub-process ensures that the data (and metadata) to be disseminated do not breach the appropriate rules on confidentiality according to either organisation policies and rules, or to the process-specific methodology created in sub-process 2.5 (Design processing and analysis). This may include checks for primary and secondary disclosure, as well as the application of data suppression or perturbation techniques and output checking. The degree and method of statistical disclosure control may vary for different types of outputs. For example, the approach used for microdata sets for research purposes will be different to that for published tables, finalised outputs of geospatial statistics or visualisations on maps.

In applying the protection of statistical data, two basic approaches are distinguished:

- Protection of tables: For the protection of tables it is necessary to determine all the tables at the same time, their links and the rules for protection. Care should be taken not to set the tables in more detail than is necessary as this lowers the level of protection. Protection can be done with the help of the Tau Argus program (round control or missing data method) and manually.
- Microdata Protection: Microdata protection is defined in the file that contains only variables that the researcher or the public wants. Microdata do not contain direct identifiers. Sensitive variables and their sensitivity classes are defined. The protection threshold and the classes for the variables to be combined are determined and the microdata protection methods are selected. The rules for protection vary depending on whether the microdata will be transmitted to the researchers or to the public. Sensitive combinations of variables are protected with the help of the Mu-Argus program.

Quality guidelines

Data requests must always be satisfied by using data access channels that are the most suitable in terms of data confidentiality and data access considerations. Users can receive information on data access channels and their operational characteristics from publicly available sources.

Data access channels must be selected in a manner that takes the differing legal, physical and confidentiality protection characteristics of the individual channels into account. If there are no confidentiality concerns, data request must be satisfied via the channel identified by the user.

Disclosure risks have to be assessed by every data access channel. The access mode determines the proper SDC methods to be applied on the datasets which ensure protection of information on the statistical units.

In order to assure balanced disclosure risk, SDC is complemented by legal protection, which explains applying SDC methods at different scales. Degrees of SDC:

- Dissemination of tabular data – strong,
- Release of public use files – strong,
- Release of anonymised microdata– medium,
- Data access in Safe Centre – weak,
- Remote execution – weak,
- Remote access – weak.

Regarding tabular data, it is cell sensitivity measured by various methods that carries disclosure risk.

If tabular data are disseminated, the threshold rule, (n,k)-dominance rule and p%-rule can be used. In accordance with the relevant legal regulations regarding the threshold rule 'n' equals three has to take into consideration. In the course of output checking beyond threshold rule, the (n,k)-dominance rule is also borne in mind.

In order to provide safe tabular data, various methodological solutions are applied.

The most frequently adopted methods are cell suppression, aggregation and rounding.

In order to provide safe microdata, various methodological solutions are applied.

The most frequently adopted methods are global recoding, bottom and top coding, rounding, micro-aggregation and local suppression.

SDC methods exert an impact on the quality of the data.

The SDC methods exert impacts to a varying degree on the datasets to be protected. Towards this end, when SDC methods are selected, the effect of the individual methods on data quality must be deliberated upon.

If tabular data are disseminated or anonymised microdata are released, efforts should be made to ensure data confidentiality in a fashion that entails the least possible loss of data, i.e. keeping disclosure risk to a bare minimum.

If tabular data are published, cells only in an absolutely necessary number should be suppressed in the interest of confidential data not to be divulged. If there is more than one possibility of suppressing the least possible number of cells, we should adopt the solution where, overall, the number of the contributors to cell values is the lowest. The suppression of totals (columns and rows) should also be avoided.

If microdata are released, only the variables requested by the user should be included in anonymised micro dataset(s); furthermore only the variables the confidentiality protection of which is justified need to be modified.

In the course of output checking and releasing anonymised microdata, elaboration of methodological documentation is required.

The documentation should contain the main steps of the SDC methods applied to the dataset(s) intended to be released in the interest of providing a comprehensive view and ensuring reproducibility.

Data cannot be withheld by citing data confidentiality considerations if such withholding is due exclusively to data quality issues.

If there are quality-related objections against the relevant data set, such must be pointed out to the user requesting the data. Data cannot be withheld by citing data confidentiality considerations if objections to the relevant data set are exclusively of quality nature.

In cases that raise confidentiality concerns, the recommendation of the Data Protection Board can be requested.

The Data Protection Board issues recommendations and adopts stances concerning methodological, legal, IT and dissemination issues affecting data confidentiality. All INSTAT employees may seek the opinion of the Data Protection Board on data confidentiality issues affecting data management. The recommendations of the Data Protection Board are available for all staff members at the INSTAT's intranet site.

Quality dimension

- ✓ Statistical Confidentiality and security

Possible quality indicators

- ✓ To what extent is the business process using standard or well-known methods identification and protection of sensitive information?
- ✓ To what extent is the data protected from the risk of disclosure of sensitive information?
- ✓ To what extent is the data actually protected? What is the residual risk of disclosure?
- ✓ To what extent has the usability of the data been degraded? What is the loss in precision or level of detail?
- ✓ Rate of disclosure risk
- ✓ Number of suppressed cells
- ✓ Rate of lost information
- ✓ Satisfied user needs
- ✓ Number of successful attempts disclosing confidential data in case of high sampling error, any data should not be disclosed

6.5 Finalise outputs

This sub-process ensures the statistics and associated information are fit for purpose and reach the required quality level and are thus ready for use. It includes:

- Completing consistency checks;
- Determining the level of release, and applying caveats;
- Collating supporting information, including interpretation, commentary, technical notes, briefings, measures of uncertainty and any other necessary metadata;
- Producing the supporting internal documents;
- Conducting pre-release discussion with appropriate internal subject matter experts;
- Translating the statistical outputs in countries with multilingual dissemination;
- Approving the statistical content for release.

Quality guidelines

Decision on the level of disclosability must be made in respect of the values of quality indicators and data protection issues.

In order to determine threshold values, international practice and practice adopted in similar surveys should be used.

Disclosed data with high sampling error, non-response or imputation rate should be tagged.

If quality indicators are below the threshold level the data can be disclosed if appropriately tagged. Uniform notations should be used for different forms of disclosures.

In the case of tabulated data, key figures must be checked.

Testing the tabulation process alone cannot guarantee that the generated data contain the right values. (e.g. the data of 2 counties have been mixed up)

Documentation has to cover the entire process of data generation as well as the tools, terms, nomenclatures and methodologies used.

Before disclosure, concordance between the data disclosed and the source concerned must be checked, i.e. we must ensure that source data and the steps of processing lead to the very results that are disclosed.
We must use the same data source and database for disclosures, which helps avoid that different data are published on respect of the same scope of data

Quality dimension

- ✓ Relevance
- ✓ Accuracy and reliability
- ✓ Accessibility and clarity
- ✓ Metadata completeness

Quality indicators

- ✓ Data completeness – rate
- ✓ Number of planned outputs that were not disseminated
- ✓ The rate of completeness of metadata is the ratio of the number of metadata elements provided to the total number of metadata elements applicable.
- ✓ Number of errors that were detected and had to be corrected
- ✓ The rate of completeness of metadata is applicable:
    - o to all statistical processes;
    - o to producers
- ✓ Data completeness rate: extent to which the outputs satisfy requirements (e.g. from regulations or other agreements with users).
- ✓ Could be calculated as the ratio of the number of data cells obtained to the number of data cells required

Loading of data into data warehouse
Quality guidelines

The database must be maintained in accordance with a uniform rule of procedures.

The professional and IT tasks must be performed in accordance with the procedural rules of the data warehouse and the dissemination database, which contain requirements for content editing, the generation of a new set of data, uploading data into the databases, the ex post correction and modification of data as well as planning and permit documents. The database should be operated and maintained in accordance with an in-house schedule which also contain the persons responsible for the task.

Access to data of public interest must be provided by using state-of-the art IT and communications technologies.

All data from official statistical data collection are data of public interest, therefore, access to data for users must be ensured. Such tools are statistical data warehouse and dissemination database making ad hoc queries of data possible. Statistical data are and entered into the data warehouse available for internal (in-house) users, on the basis of the metadata generated in the course of statistical production and in a metadata-driven way. These metadata not only help uploading, but also help users to interpret data adequately later during dissemination. The dissemination databases a variant of the data warehouse with a narrower data content which does not contain any protected data and is available for external users by web-based browser.

Databases should meet user needs.

In order to discover user needs query data of the data sets of the database must be examined, user opinion surveys on the content and the functionality of the database must be conducted, possibilities of technological innovation must be monitored (analyses of web statistics and user habits, compilation of on-line questionnaires and interviews and, based on these, compilation of action plans and following trends and technologies).

Training must be organized to support the operators and users of the database.

Training courses must be organized to help acquiring the skills and knowledge needed for the operation and the use of the database (INSTAT training for operators and internal users, lectures and information events for external users, ensuring access to documents).

Possible quality indicators

- Trends in the queries of data sets = number of the queries of data sets in the current period/number of the queries of data sets in the preceding period*100
- Changes in the number of data sets = the number of data sets in the current period/the number of data sets in the preceding period
- Changes in the number of indicators = the number of indicators in the current period/the number of indicators in the preceding period
- Session rates of databases
- Number of training courses

7. Disseminate phase

This phase manages the release of the statistical products to users. It includes all activities associated with assembling and releasing a range of static and dynamic products via a range of channels. These activities support users to access and use the products released by the statistical organisation. For statistical products produced regularly, this phase occurs in each iteration.

The "Disseminate" phase is broken down into five sub-processes (schema above), which are generally sequential, from left to right, but can also occur in parallel, and can be iterative. These sub-processes are:

7.1 Update output systems

This sub-process manages the update of systems (e.g. databases) where data and metadata are stored ready for dissemination purposes, including:

- Formatting data and metadata ready to be put into output systems;
- Loading data and metadata into output systems;
- Ensuring data are linked to the relevant metadata.

Formatting, loading and linking of metadata should preferably mostly take place in earlier phases, but this sub-process includes a final check that all of the necessary metadata are in place ready for dissemination.

Quality guidelines

We prepare our statistical dissemination products being aware of users' and decision-makers' needs.

- Our publications are released in accordance with our Dissemination Policy.
- If possible, manuscripts contain methodological descriptions and information on the availability of further information.
- From the publication portfolio, we choose the publication type that best suits the publication of the manuscript being aware of user groups and user satisfaction.

We publish accurate and timely data.

- We ensure the supervision of data as well as concordance between the data published and the source.
- Decision on the publication of preliminary data
- We fully comply with data protection regulations.

We publish our data in a standard format by using the available resources efficiently.

We minimize the time between the availability and the publication of data.

Our publications of international interest are also released in whole in English.

- Subject to user needs, some products are also published in English.
- Language revision and the translation of Albanian manuscript into English are regulated by the procedural rules on translation and revision.

Quality dimension

- ✓ Accessibility and clarity
- ✓ Managing metadata

Possible quality indicators

- ✓ Date of last update of the content of the metadata. - The date of the latest dissemination of the metadata should be specified. - The date on which the metadata element was inserted or modified in the database should be specified.
- ✓ Extent to which metadata are available and accessible
- ✓ Timeliness of release (current day + number of days)
- ✓ Rate of erroneously released publications
- ✓ Rate of revised analyses

7.2 Produce dissemination products

This sub-process produces the dissemination products, as previously designed in sub-process 2.1 (Design outputs), to meet user needs. They could include printed publications, press releases and websites. The products can take many forms including interactive graphics, tables, maps, public-use microdata sets, linked open data and downloadable files. Typical steps include:

- Preparing the product components (explanatory texts, tables, charts, maps, quality statements etc.);
- Assembling the components into products;
- Editing the products and checking that they meet publication standards.

Quality guidelines

The process of production of publication is regulated and documented.

The publication of the individual product types is in accordance with the Image rules.
We develop and operate redaction templates.
Manuscript preparation procedures regulate the transparent preparation and redaction of manuscripts taking priorities in account, in order that the deadlines in the dissemination calendar and the dissemination programme can be met.
The manuscript is prepared by the author in accordance with the Publication Handbook.
Revising and arithmetic checks are regulated by procedural rules.
The content preparation of manuscripts by several organizational units is ensured by operation of editorial board in accordance with the relevant procedural rules.
Contracted revision is regulated by procedural rules for revision..

Quality dimension

- ✓ Quality commitment
- ✓ Relevance
- ✓ Accessibility and clarity

Quality indicators

- ✓ Ratio of statistical products that are disseminated with quality statements/quality reports
- ✓ The rate of available statistics
- ✓ The indicator is the ratio of the number output data elements provided in accordance to a relevant regulation to those required by the regulation.
- ✓ The extent to which all statistics that are needed are available.
- ✓ Percentage of/Extent to which "statistical outputs/products" meets users' needs
- ✓ Description of users and their respective needs with respect to the statistical data.
- ✓ The extent to which relevant metadata is linked to output data

7.3 Manage release of dissemination products

This sub-process ensures that all elements for the release are in place including managing the timing of the release. It includes briefings for specific groups such as the press or ministers, as well as the arrangements for any pre-release embargoes. It also includes the provision of products to subscribers, and managing access to confidential data by authorised user groups, such as researchers. Sometimes an organisation may need to retract a product, for example, if an error is discovered. This is also included in this sub-process.

Quality guidelines

Each year the office compiles a dissemination calendar setting forth the dates of the fulfillment of its dissemination obligations.

The dissemination calendar is compiled in accordance with the applicable procedural rules taking the following criteria into account:

- Publication of one first release per working day if possible,
- Determination of the date of the release depends on the capacity needed for the production of the first release and on the fact that national data should be published in the corresponding EUROSTAT publications.

First releases meeting user and decision maker needs and international obligations must be published at the dates declared in the dissemination calendar.

Based on user and decision maker needs and international obligations, first releases must be revised: Realized releases are documented.

Dissemination programme for further publications is created.

- The compilation of the weekly dissemination programme is regulated by procedural rules.
- The office keeps records of the realization of releases.

- Dissemination programme of other publications is compiled in accordance with dissemination policy, the criteria and priorities set by the presidency of INSTAT as well as the applicable procedural rules.
- Realized releases are documented.

The manuscripts of releases (e.g. publications, news, announcements, etc.) prepared for approval should meet the content and form criteria applicable to them.

Approval of the manuscripts meeting content criteria. Compliance with the procedural rules on revision.

Prevention of data leaks

- Compliance with the form-related criteria of releases on the basis of the Image Rules.
- Compliance with the procedural rules of approval.
- Pre-released publications must be labeled as "embargoed" in accordance with the rules of pre-release access (President's directive).
- Pressroom releases are regulated by internal regulations.

Releases with a fixed date (day/week) and all other releases must be announced in advance.

If any factor hinders release, delay in the release should cause the least possible inconvenience and lack of information to users.

- Dissemination programme and catalogue are released and operated on-line in accordance with the applicable procedural rules.
- An announcement must be released on any deviation from the releases announced in advance citing the reasons for the delay and setting a new date for the release.
- Realized releases must be documented.

Approved data, information, announcements and publications must be released on the date set in advance.

In accordance with the procedural rules governing release, via appropriate channels of releases:

- At our website, in accordance with the rules regulating the operation of the website
- In a printed format, in accordance with the procedural rules of mailing publications
- Realized releases are recorded.

Releases should be in conformity with the quality assurance principles that also comply with professional and user needs.

High level comprehensible training for user groups

If releases occur at the website, the following should be performed:

- Programming and development etc.,
- Live operation in the case of e.g. first releases,
- Updates, revision,
- Archiving of data files in accordance with the procedural rules for archiving.

If releases occur in a printed form:

- Ensuring the availability of the appropriate printing capacity based on printing contracts,
- Checking printing quality in accordance with a fixed color spectrum,
- Supervision of books in sheets, keeping of printing logbooks and preparation of accounting documents in accordance with the relevant procedural rules,
- Safe-keeping of the databases and the test prints of printed materials in accordance with the archiving regulations.
- The issues frequently raised by users must be addressed by training.
- The language and practical approaches of training materials must be adjusted to the composition of user groups.
- Homogeneous user groups are trained by experienced well-prepared instructors.
- Feedback should be provided both inside and outside the classroom.

Access to anonymized micro-data

- When releasing micro-data, relating metadata must be attached as well.

A description of the applied methodology of anonymization and the variables affected must be attached too.
Information on data quality including loss of information due to anonymization must also be provided for researchers.

Opening access
Termination of access
Release of research results

Press conferences must be held in justified cases and attention must be paid to the issues discussed at the events.

- Subsequent to a data protection-related check, research results approved by data owner organizational units must be released to researchers without delay.
- Upon release of research results researchers must be informed whether any modification has been made to the results for reasons of data protection. If yes, the modification (e.g. cell suppression, rounding) must be identified.
- Likewise, the locations of the modifications in the result must also be provided.

They aim at providing extensive information for journalists on analyses of national interest, presenting the methodology applied and stressing the differences between professional terms and colloquial language. Only correlations that can be substantiated by statistical means are to be discussed. Assumptions and forecasts to be avoided.

Publications published must be accurate, at a high professional standard, comprehensible and impartial.

Compliance with analysis guidelines.

Quality dimension

- ✓ Impartiality and objectivity
- ✓ Transparency
- ✓ Accuracy and reliability

- ✓ Timeliness and punctuality
- ✓ Accessibility and clarity
- ✓ Coherence and comparability
- ✓ Statistical Confidentiality and security

Possible quality indicators

- ✓ Availability and accessibility of revision policy (Yes/No)
- ✓ Time lag between the release of an output and announcement of the error to the users
- ✓ Number of press meetings held before and after the release of outputs
- ✓ Number of errors corrected in disseminated products
- ✓ Punctuality of statistical outputs
- ✓ Punctuality is the time lag between the delivery/release date of data and the target date for delivery/release as agreed for delivery or announced in an official release calendar, laid down by Regulations or previously agreed among partners.
- ✓ The punctuality of statistical outputs is applicable:
    - o to all statistical processes with fixed/pre-announced release dates,
    - o to users and producers, with different aspects and calculation formulae.
- ✓ Time lag - first results.
    - o General definition: The timeliness of statistical outputs is the length of time between the end of the event or phenomenon they describe and their availability.
    - o Specific definition: The number of days (or weeks or months) from the last day of the reference period to the day of publication of first results.
    - o This indicator is applicable:
        - ▪ to all statistical processes with preliminary data releases;
        - ▪ to producers.
- ✓ Time lag - final results
    - o General definition: The timeliness of statistical outputs is the length of time between the end of the event or phenomenon they describe and their availability.
    - o Specific definition: The number of days (or weeks or months) from the last day of the reference period to the day of publication of complete and final results.
    - o This indicator is applicable
        - ▪ to all statistical processes;
        - ▪ to users and producers, with different level of details given
- ✓ Availability of a dissemination policy defining dissemination practices and its availability on the web site
- ✓ Availability of a release calendar and its availability on the web site
- ✓ Number of first releases published not according to dissemination calendar in a breakdown by cause (capacity and detected error, etc.)
- ✓ Timeliness of first releases (T + days)
- ✓ Number of analytical and data products accessed
- ✓ Percentage of website visitors who found the information that they were looking for
- ✓ Length of comparable time series
    - o Number of reference periods in time series from last break.
    - o Number of training sessions for users, number of participants, user evaluation (there should be a comparable system of evaluation)
    - o Comment: Breaks in statistical time series may occur when there is a change in the definition of the parameter to be estimated (e.g. variable or population) or the methodology used for the estimation. Sometimes a break can be prevented, e.g. by linking.

- The length of comparable series is applicable:
  - to all statistical processes producing time-series;
  - to users and producers, with different level of details given.

- ✓ Although disclosure control of individual statistical products is done in 6.4, at 7.3 additional measures should be taken to protect against disclosure that could result from researchers combining several different statistical products.
  - are researchers who have access to micro data legally bound to uphold confidentiality and security protocols of the INSTAT
  - are research proposals submitted for approval by INSTAT analysts (analysts must approve the relevance of the analysis and the appropriateness of the methods)
  - are there policies in place that ensure outputs are vetted prior to their dissemination
  - are there confidentiality rules in place, such as a minimum number of units in a cell when doing cross-tabulations, and a maximum number of data requests per day with a maximum number of variables per request (to protect against penetration by an automated data mining process).

7.4 Promote dissemination products

Whilst marketing in general can be considered to be an overarching process, this sub-process concerns the active promotion of the statistical products produced in a specific statistical business process, to help them reach the widest possible audience. It includes the use of customer relationship management tools, to better target potential users of the products, as well as the use of tools including websites, wikis and blogs to facilitate the process of communicating statistical information to users.

This sub-process is concerned with the active promotion of produced statistical products to help INSTAT reach a broader audience. It includes the use of user management tools, better targeting static product users, and the use of tools, including websites or Facebook, to facilitate the process of communicating statistical information to users.

Quality Dimension

- ✓ Relevance
- ✓ Accessibility and clarity
- ✓ Metadata - consultations

Quality indicator

- ✓ User satisfaction surveys shall include questions on the opinions of users about metadata availability
- ✓ The number of social media visitors/followers
- ✓ User satisfaction about the metadata availability
- ✓ Number of metadata consultations (ESMS) within a statistical domain for a given time period.
  - This indicator is applicable:
    - to all statistical processes;
    - to producers
- ✓ Number of consultations of data tables within a statistical domain for a given time period

7.5 Manage user support

This sub-process ensures that user queries and requests for services such as microdata access are recorded, and that responses are provided within agreed deadlines. These queries and requests should be regularly reviewed to provide an input to the overarching quality management process, as they can indicate new or changing user needs. Replies to user requests can also be used to populate a knowledge database or a "Frequently Asked Questions" page, that is made publicly available, thus reducing the burden of replying to repeated and/or similar requests from external users. This sub-process also includes managing support to any partner organisations involved in disseminating the products.

Quality guidelines

Users should be familiarized with the statistical products generated and the services provided by the office.

Users should have an easy access to information on products and services at the website of the office.

Annual marketing plans setting forth the objectives for the year concerned, enlisting efficient marketing tools needed to realize the objectives along with methods as well as a draft budget must be prepared.

Users should receive clear information on the fact that some products and services of the office are free of charge or available for a fee.

The website should be able to provide users with detailed information in a well -structured easy-to-follow format using links for navigation.

Communication should reflect reliability and objectivity.

Statistical services must be defined with the legal environment borne in mind. The fees charged for statistical services must be made publicly available for users.

Impartial unbiased answers must be given to malicious questions.

Communication should reflect the image of an office providing reliable and objective data: it suggests that, similar to the disclosure of the data on the office, data supply also serves public interest.

PR aims at creating and reinforcing the image of an institution generating objective, relevant and timely data.

Media request should be responded to fast. All requests must be granted. Information on possible sources of data is not collected by the Office.

Self-study and professional training are essential for the staff of the information services.

Appropriate professional expertise is required for supplying customers with accurate up- to-date information at all times.

Furthermore, if an expert opinion is invited, a uniform standpoint adopted by the individual areas must be communicated to the information services. Preliminary control of the information to be sent reduces the possibility of erroneous answers.

Customer management must be fast and efficient.

Internal processes must be developed and regulated in procedural rules in order that customers may receive requested information by the deadline set for response or, if such is not possible, feedback on the current state of the administrative procedure.

Providing expert support – if necessary by arranging procedural rules for substitution – is part of fast service.

Information services must operate in accordance with a form and content-related protocol.

Adopting a uniform standpoint and its communication to customers in the case of critical or problem issues. Service should be provided in a standardized manner meaning compliance with the course of procedures set forth in the applicable procedural rules and the use of template letters.

A customer-friendly information service must be provided.

Commitment and customer focus are key characteristics for the staff of the information services. Participation in training organized specifically for staff of the information services is equally important.

This means e.g. the fast and customer-friendly management of customer feedback on and complaints about service provision.

The operation of the information service must be monitored and evaluated continuously.

A system for the regular measuring and evaluation of customer satisfaction must be developed.

Customer needs and the satisfaction must be fully documented.

All customer needs received via any channel (telephone, e-mail, ordinary mail etc.) must be recorded in some form.

Quality dimension

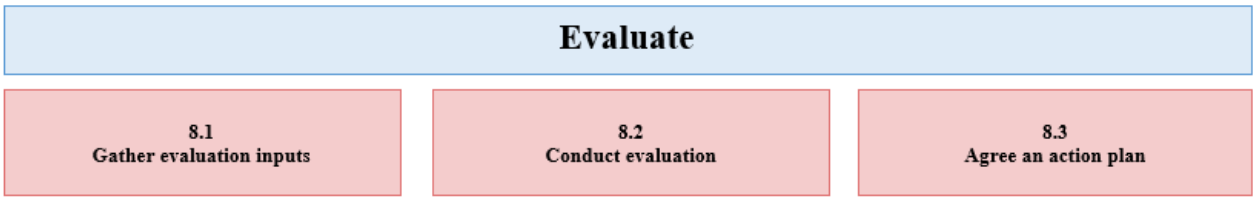
- ✓ Relevance
- ✓ Accessibility and clarity

Quality indicators

- ✓ User satisfaction index
- ✓ Length of time since most recent user satisfaction survey
- ✓ Measures to determine user satisfaction.
- ✓ The percentage of unmet user needs.
- ✓ Time since last user consultation, in terms of years or months

- ✓ Availability of an information service/unit or a call center to users to answer enquires about data and metadata issues

8. Evaluate phase



This phase manages the evaluation of a specific instance of a statistical business process, as opposed to the more general overarching process of statistical quality management described in Section VI (Overarching Processes). It can take place at the end of the instance of the process, but can also be done on an ongoing basis during the statistical production process. It relies on inputs gathered throughout the different phases. It includes evaluating the success of a specific instance of the statistical business process, drawing on a range of quantitative and qualitative inputs, and identifying and prioritising potential improvements.

For statistical outputs produced regularly, evaluation should, at least in theory, occur for each iteration, determining whether future iterations should take place, and if so, whether any improvements should be implemented. However, in some cases, particularly for regular and well established statistical business processes, evaluation might not be formally carried out for each iteration. In such cases, this phase can be seen as providing the decision as to whether the next iteration should start from the "Specify Needs" phase, or from some later phase (often the "Collect" phase).

The "Evaluate" phase is broken down into three sub-processes (schema above), which are generally sequential, from left to right, but can also occur in parallel, and can be iterative. These sub-processes are:

8.1 Gather evaluation inputs

Evaluation material can be produced in any other phase or sub-process. It may take many forms, including feedback from users, process metadata (paradata), system metrics, and staff suggestions. Reports of progress against an action plan agreed during a previous iteration may also form an input to evaluations of subsequent iterations. This sub-process gathers all of these inputs, compiles quality indicators and makes them available for the person or team producing the evaluation. The collection of some of these evaluation materials can be automated and take place in a continuous way throughout the whole process, as defined by the quality framework (see Quality Management in Over Arching Processes Section). On the other hand, for the evaluation of certain processes it can be necessary to perform specific activities such as small surveys, (e.g. post-enumeration surveys, re-interview studies, survey on effectiveness of dissemination).

Quality guidelines

All statistical data production processes must end with evaluation and feedback.

Evaluation should be embedded in all statistical data production processes. Evaluation can be performed on processes and product quality as well (e.g. entire processes, a specific process phase or product quality along quality criteria).

Repeated evaluation on regularly produced statistical products also facilitates future action plans aimed at quality development.

Evaluation must be followed by feedback whenever required.

If evaluation reveals that expectations were not fully met, intervention in a specific process phase must be carried out or a process or process phase must be repeated. This is called feedback (feedback as development is part of quality management, see "Quality management overarching process phase").

Recommendations for development as a result of feedback should be embedded in the planning process for the following period.

If processes are properly planned, the result of the evaluation helps in deciding which process phase needs to be repeated in the next period (e.g. whether we need to start the next survey as well with I. Specify needs or we can skip process phases and start with 4. Collect).

When planning the next period, it is important that recommendations for development of the data production process should also be taken into account and feedback should be embedded in planning. By doing so we create cyclicity for developments, because in order to keep surveys up-to-date, the ability to flexibly collect information and respond to new needs must be maintained and improved.

Process quality must be evaluated already during data production process when carrying out sub-process phases.

Process quality should be evaluated already during data production process (process quality assurance).

In the course of data production process participants and those responsible for surveys monitor the quality of process and sub-process phases and assess if activities have been performed in line with the expectations for the individual phases. Thus, those who are concerned on one hand should be familiar with quality criteria for the specific process and sub-process phases and on the other hand monitor the values of the process variables reflecting these expectations (e.g. number of incoming questionnaires filled in with data). If variables are still below the required value and, if possible, they intervene in the process (e.g. urging). If such activity is no longer possible, participants in the process must be warned or, based on the information available, the responsible person will decide on the next step in processing and, if necessary, modify processing (e.g. more imputing).

In order to be able to evaluate quality, we must compare expectations with documented quality.

The essence of quality evaluation is comparing documented quality with requirements, establishing the degree of correspondence, identifying any shortfalls and risks, putting forth recommendations for the elimination of shortfalls and the mitigation of risks or perhaps for the modification of existing requirements or other elements.

A pre-condition for evaluation is the availability of the documentation regarding expectations and quality measurement (they form parts of quality management, see the overarching process phase of Quality Management).

Quality Dimension

- ✓ Output quality

Possible quality indicators

- ✓ Extent to which quality indicators have been collected for all phases and subphases including costs and timeliness of phases and sub-phases.
- ✓ Types and relative weight of different measures gathered (e.g. quantitative indicators, feedback from users, paradata or other metrics derived by procedures, staff suggestions, interviewers/supervisors follow ups)

For the list of product and process quality indicators of the INSTAT and a list of key quality and performance quality indicators of Eurostat, see Annexes 1 to 3. We refer to the catalogues providing more detailed descriptions of indicators in the sources of annexes.

8.2 Conduct evaluation

This sub-process analyses the evaluation inputs, compares them to the expected/target benchmarking results (when available), and synthesises them into an evaluation report or control dashboard. The evaluation can take place at the end of the whole process (ex-post evaluation) for selected activities, during its execution in a continuous way, or throughout the process, thus allowing for quick fixes or continuous improvement. The resulting report should note any quality issues specific to this iteration of the statistical business process as well as highlight any deviation of performance metrics from expected values, and should make recommendations for changes if appropriate. These recommendations can cover changes to any phase or sub-process for future iterations of the process, or can suggest that the process is not repeated.

Quality guideline

Evaluation must be consistently performed relying on the evaluation tools already available and integrated into the quality assurance framework system.

Evaluation tools can be the following:

- Self-assessment in respect of products and processes (e.g. quality reports, self-assessment questionnaire/ DESAP checklist, relying on quality indicators and documentation according GSBPM).
- Evaluation of user satisfaction surveys, user fora
- Internal and external quality audits,
- Expert consultations,
- Benchmarking and benchlearning.

When selecting evaluation methods, it is important that efforts must be made at gradation.

Users' opinion can be invited by conducting surveys or holding user fora. Continuous keeping in contact with key users is also expected.

Internal (in-house) or external (contracted) experts must sometimes be involved in evaluation and feedback.

Due to expanding the circle of the experts and the stakeholders involved in self-assessment, internal and external audits go beyond self-assessments. External contribution can help with the improvement of subject-matter domains by emphasizing special aspects and knowledge through experts.
The first step should be self-assessment based on the right measurement tools (quality reports, quality indicators and process indicators) followed by internal audits and finally application of external audits.

If not in all cycles, but if major modifications are made or at least every 5th year, we should involve internal experts and, in justified cases, external ones.

In addition to process quality assurance, product quality assessment is also an important factor which must be taken into consideration when evaluation is made.

The quality of the completed statistics is evaluated by the person responsible for statistics on the basis of product quality indicators (requested by EUROSTAT, INSTAT standards and internally developed) and other information available as a result of production process. Product quality is documented in the quality report (EUROSTAT, INSTAT standard). In addition to documentation, annual qualitative and aggregate evaluation must also be performed.

If any elements of product quality fail to meet the expectations, self-assessment covering the entire process must be conducted.

If any elements of product quality fail to meet the expectations, the following options are available: publication of the product, publication of the product after corrections and postponement of the publication.

In this case, independent of the decision on publication, prior to the start of the next cycle or at the earliest possible date, self-assessment covering the entire process should be conducted using a checklist (INSTAT Self-assessment Questionnaire, DESAP checklist). Relying on the outcome of these, further audits may be needed. Based on the results, possible decisions are the modification of the process or the modification of the requirements in order that the best possible quality product can be produced in the next period.

In the course of quality assessment the components of quality must also be taken into account.
The quality of products must be examined along the components of quality (relevance, accuracy, timeliness, punctuality, accessibility, clarity, comparability and coherence), which enables us to regularly monitor changes in the quality of the products and intervene if needed.

In addition to accuracy, other quality components also need to be considered.

It is important that in the course of the evaluation we should collect available information on all the components of quality that may serve as a basis for evaluation not just the components that are easy to measure (e.g. response rates within accuracy).

Before data survey launch, the results of previous cycles must be examined.

Before a cycle starts, the results of the previous one should be examined (timeline of quality indicators, quality reports, earlier evaluations, actions and their impact that are available in a documented manner), the requirements (products, processes) should be reviewed, justified modifications must be added and, if necessary, re-plan surveys.

Evaluations on quality are public and available.

All information on quality inside INSTAT is public. The various subject-matter areas can rely on it in their decisions on surveys (e.g. whether increase in non-response is a mass phenomenon or is only typical in relation of the specific survey). Subject-matter areas annually evaluate quality reports shared within the INSTAT.

Quality Dimension

- ✓ Soundness of implementation
- ✓ Cost effectiveness
- ✓ Output quality
- ✓ Timeliness and punctuality

Quality indicator

- ✓ To what extent process components satisfy process quality requirements such as Efficiency, Effectiveness; Robustness; Flexibility; Transparency and Integration
- ✓ Percentage of GSBPM phases and subprocesses for which there were no gaps between planned and attained costs
- ✓ Extent to which quality indicators are close to target values (includes all indicators and metadata such as those needed for quality reporting)
- ✓ Trends in quality indicators (e.g. improvements/worsening) for recurring processes
- ✓ Percentage of quality dimensions and sub-dimensions (e.g. for accuracy) that was not possible to assess and why.
- ✓ Percentage of GSBPM phases and subprocesses for which there were no gaps between target and achieved timeliness
- ✓ Have evaluated substantial changes in quality indicators? (Yes/No)

Quality review practice

Quality review is concrete way of improving quality. INSTAT will deal with quality review in assessing the quality process and products by Direct Quality Assessment based on audit and self-assessment.
Quality Assessment is:

- ✓ a way for highlighting strengths and weaknesses of a statistical process
- ✓ a tool for improving weaknesses
- ✓ an approach for collecting and disseminating good practices

The procedure that INSTAT will follow:

- ✓ Quality Guidelines
- ✓ Assessment
- ✓ Report

Quality guideline

One handbook

- ➢ Direct surveys and Processes that use administrative data included in one;
- ➢ Structure & content of the Quality Guidelines:
  - Length: about 121 pages;

- General information on Institutional environment, Strategy of Quality Management, Metadata System;
- Quality guidelines to be followed (how to assure the compliance to the phase / sub phase of statistical processes by GSBPM and Text describing what should be done)
- Quality dimensions identified by GSBPM to be followed;
- Quality indicators identified to be measured;

Assessment

The tools for assessing the statistical processes are:

- ✓ Audit and Self-assessment

AUDIT

- ➢ Preparation of the documentation (process manager)
- ➢ Study of the process (audit team)
- ➢ The interview
- ➢ Final evaluation report

SELF-ASSESSMENT

- ➢ Preparation of the documentation (process manager)
- ➢ Compilation of the assessment questionnaire (process manager)
- ➢ Final evaluation report

Preparation of the documentation includes:

The assessment questionnaire - by having it mirrors the quality guidelines and questions on: i) What is performed; ii) How it is performed; iii) Quality control and measurement. As well the specific assessment questions are part of the questionnaire with questions on i) Process quality; ii) Sources of errors; iii) Statistics Quality.

Training and operational manual- Auditors and process managers involved in the programme should be trained. An operational manual describes: i) Aims of the evaluation; ii) Procedures step-by-step; iii) Roles: who does what; iv) Scheduling of the activities; v) Supporting tools (process quality and product quality reports).

The involved actors – i) Quality Committee; ii) Auditing Secretariat (from the quality team); iii) Auditors and reviewers; iv) Process managers and main collaborators; v) Directors; vi) Board of Directors.

The final assessment report – i) Summary of the evidences; ii) Results; iii) Improvement actions; iv) Good practices to be identified.

The steps how to proceed:

Step 1: Auditors pool and Processes selection

Every beginning of the year, within the Quality committee a request to the production, methodological and IT units of staff required to be included in the auditors and reviewers pool. The selected auditors/reviewers are in charge for two years (but can be confirmed). They are not allowed to carry out more than an audit per year. The request to the production units of processes to undergo:

- auditing → a subset will be audited also for IT elements
- self-assessment

the set of activities to be done during the Quality Committee meeting: Matches selected process with teams of auditors or reviewers (self-assessment) and appoint a member of the Quality Committee as supporting the reviewers.

Step 2: Communication and training

The Quality team meets the survey managers of the selected processes separately (auditing and self-assessment) and provides to the survey managers all the relevant material. Also they provide one-day course for the auditors and one-day course for the reviewers involved in self-assessment (auditing and self-assessment procedure).

Step 3: Kick off

Survey managers, analyze the material: guidelines, questionnaires, templates, procedure and set up the documentation supporting the evaluation activity of the auditors: process report, product report (audit only) or fill in the self-assessment questionnaire (self-assessment only).

Step 4: Auditing Interview

Auditing teams have to study the supporting documentation: process report, product report. The interviewing object is the Survey manager (and collaborators). After interviewing a final evaluation report with strengths and weaknesses is drawn.

Step 5: Drafting of the final evaluation report

Survey managers draw a Final Evaluation Report with strengths and weaknesses and with improvement actions and good practices (self-assessment only), while complete the Final Evaluation Report with improvement actions and good practices (audit only).
Reviewers and auditors check coherence in the Final Evaluation Reports - strengths and weaknesses on the one side and good practices and improvement actions on the other side.

8.3 Agree an action plan

This sub-process brings together the necessary decision-making power to form and agree an action plan based on the evaluation report. It should also include consideration of a mechanism for monitoring the impact of those actions, which may, in turn, provide an input to evaluations of future iterations of the process.

Quality dimension

- ✓ Quality commitment

Quality indicator

- ✓ Extent to which the action plan contains commitment mechanisms for monitoring the impact of improvement actions.
- ✓ Assuming that an evaluation report was prepared in 8.2 for quality indicators of previous GSBPM phases, and the gaps were identified between the expected and actual quality of the output, cost

effectiveness and timeliness; then the decision needs be made to take action for areas where the gaps are identified.
The quality indicator is the ratio of: the number of actionable quality issues (quality indicators where problems are identified or targets are not met) / to the total number of quality issues.

- ✓ Also a plan can be made to not take an action for all actionable items but for some of them. In that case the quality indicator is: number of quality issues to take action for divided by the number of all actionable quality issues.
- ✓ Completion rate of the action plan is: the number of successfully fixed or improved quality issues divided by total number of quality issues planned to be fixed

Improvement actions and follow-up practice

The improvement actions approval & communication process - Final evaluation reports are signed by the subject-matter director; Improvement actions are discussed in the Quality Committee; Adjustments are made by process managers; Improvement actions are included in the planning system; Results of the year programme are presented to the Board of Directors; Evaluation reports and an Aggregated report on the results have to be published on internal network.

Follow-up on improvement actions - Improvement actions are flagged in the planning activity system; Improvement actions are searched in the system and the degree of implementation assessed in the following two years; Process managers are re-contacted if necessary.

Scheduling of the activities- timetable for all activities is compiled a year before.

The steps how to proceed:

Step 6: Hierarchical approval

Board of Directors receive the Final Evaluation Reports of the surveys of his/her directorate and approve improvement actions (done in section 8.2.1 “Quality review practice”) The Quality Committee discusses the Final Evaluation Reports and approve/not approves the improvement actions. They discuss to carry out the cross sectional improvement actions. At the end they analyze the good practices.

Step 7: Communication to Board of Directors

The Quality Committee develops a summary report on the Audit and Self-assessment procedure, with the improvement actions and presents it to the members of the Board of Directors (chaired by INSTAT General Director and the members are INSTAT Board of Directors).

Step 8: Improvement actions in Annual Work Program

Survey managers decide the improvement actions to be included in the next operational annual plan and communicate to the quality team those that are postponed. The improvement actions are hierarchically approved.

National Statistical System review

Eurostat recommends evaluating the compliance of other Statistical agencies responsible for the production and dissemination of official statistics with the European Statistical Code of Practice. To

carry out this process is necessary: the new quality guide already built and capacity building of INSTAT staff for internal evaluation.

OVER-ARCHING PROCESSES

The GSBPM also recognizes several over-arching processes that apply throughout the production phases, and across statistical business processes.

(The processes of quality management, metadata management and data management are further elaborated in this Section.)

QUALITY MANAGEMENT

"User perspectives, needs and priorities, which vary between processes and across groups of users"

Quality management in institutions deals with quality of the organization processes and statistical products. It follows from the core activity of the institute that the quality of products needs to be defined basically in accordance with user needs. Quality concerns organizations, processes and products. In the present framework, quality management over-arching process refers mainly to product and process quality. The main goal of quality management within the statistical business process is to understand and manage the quality of the statistical products.

Quality components offer a suitable analytical frame for a multi-approach evaluation to the quality of statistical products. The quality of products is created in the process of statistical data production. Quality management covers and extensively examines the process of statistical data production. It is closely related to the overarching process of Evaluate, the latter forming a part of quality assurance framework. Quality management thus offers a deeper and broader examination of the process of statistical data production than Evaluate overarching process. It may be the case that both the entire data production process and the sub-processes thereof need to be evaluated comprehensively. Meta-data and para-data generated in the various process phases serve as inputs for quality management. These evaluations can be carried out within a specific sub-process or group of sub-processes.

The objectives of quality management are – in the spirit of efficiency and quality – to assure process quality (e.g. avoidance of duplications, ensuring that models are comprehensive, implementation of sub-process phases in accordance with the process quality guidelines) and to implement product quality assessment (in accordance with the concept of quality and quality components) and to ensure that products (e.g. data) are produced at the highest possible quality.

In order to improve the product quality, quality management should be present throughout the statistical business process model. It is closely linked to Phase 8 (Evaluate), which has the specific role of post-evaluating individual instances of a statistical business process. However, quality management has both a deeper and broader scope. As well as evaluating iterations of a process, it is also necessary to evaluate separate phases and sub processes, ideally each time they are applied, but at least according to an agreed schedule. Metadata generated by the different sub-processes themselves are also of interest as an input for process quality management. These evaluations can apply within a specific process, or across several processes that use common components.

In addition, a fundamental role in quality management is played by the set of quality control actions that should be implemented within the sub-processes to prevent and monitor errors. The strategy could be reported in a quality assurance plan.

Within an organization, quality management will usually refer to a specific quality framework, and may therefore take different forms and deliver different results within different organizations. The current multiplicity of quality frameworks enhances the importance of the benchmarking and peer review approaches to evaluation, and whilst these approaches are unlikely to be feasible for every iteration of every part of every statistical business process, they should be used in a systematic way according to a pre-determined schedule that allows for the review of all main parts of the process within a specified time period.

Broadening the field of application of the quality management over-arching process, evaluation of groups of statistical business processes can also be considered, in order to identify potential duplication or gaps.

All evaluations result in feedback, which should be used to improve the relevant process, phase or sub-process, creating a quality loop.

Quality management can be operated by NQAF cycle in practice. This can help implement continuous product and process quality management. There are a number of forms in which components of quality management exist in practice. The relationship could be explained by: 1. Plan, 2.Do, 3.Check, 4.Act

1. ***Plan – development of a quality management plan****: quality requirements and expectations must be known and accepted. The* ***process*** *and outputs must be planned based on this. Practical manifestations of expectations: laws, regulations, standards,* ***quality guidelines****, user needs, indicators of the previous period or benchmark indicators. This quality management plan involves the description of the quality management system, the techniques and procedures of quality assurance and quality assessment and the requirements for the results derived from them and the documentation requirements of development measures.*

2. ***Do – Implementation of quality assurance****: measured information is needed on the characteristics of statistical products, work flows (processes) or the entire institution on the basis of which compliance with requirements and plans can be assessed. We need to document and measure implementation in accordance with the expectations. Tools for measuring and documentation: quality reports, product and process quality indicators, process variables, measuring user satisfaction.*

3. ***Check – For the purpose of quality assessments*** *we need to have tools so that we can compare documented and measured information with the requirements and evaluate the meeting of expectations. Manifestations of assessment: within the framework of self-assessment the revision of process and product quality and the documentation of experience (see the overarching-process phase of Evaluate) or the examination of the process control metadata; comparison of internal processes with the similar processes of other organizations (e.g. benchmarking or peer reviews, audits). Quality assessment is based on facts, i.e. its preconditions are the measurement and documentation of quality.*

4. ***Act – Action plan****: formulation of an action plan in accordance with the recommendations of the evaluation, then the monitoring of the implementation and its results. What is included in the action plan will be included in the requirements of the following period,*

in response to which the process of data production may change, thus, at the next evaluation, this will have to be taken into account; similarly, statistical standards may also change.

Examples of quality management activities include:

- Setting and maintaining of the quality framework:
- Setting of global quality criteria;
- Setting process quality targets and monitoring compliance;
- Seeking and analyzing user feedback;
- Reviewing operation and documenting lessons learned;
- Examining process metadata and quality indicators;
- Internal or external auditing on statistical processes.

Quality management also involves institutional and organizational factors. Such factors are included in other GSBPM over-arching processes (e.g. Human resources management, Statistical programme management) although they can have an impact on quality.

Quality guidelines in general

For satisfactory quality management we need an organized, documented and controlled system of quality management comprising process quality assurance and product quality assessment.

The following are needed for the operation of an organized quality assurance system – uniformly across the organizational units:

✓ **Quality requirements** and expectations, which must be known and accepted.

✓ measured information is needed on the characteristics of statistical products, work flows (processes) or the entire institution on the basis of which compliance with requirements and plans can be assessed. **Measurement** is based on **documentation**.

- we need to have tools so that we can compare information with the requirements (e.g. self-assessments and audits); we need **evaluation**. Quality assessment is based on facts, i.e. its preconditions are the measurement and documentation of quality;

- formulation of an **action and improvement plan** in accordance with the evaluation and the recommendations of the evaluation, if necessary, then the monitoring of the implementation and its results; what is included in the action plan will be included in the requirements of the following period, in response to which the process of data production may change, thus, at the next evaluation, this will have to be taken into account.

Within the framework of quality management consistent and regular SWOT analyses are conducted in the spirit of continuous product and process quality improvement.

When several sub-processes are evaluated simultaneously, we must ensure that the same metadata are used.

Need for a written and public quality policy.

If we use different metadata for evaluation, we compare an apple to a pear and fail to ensure that evaluations are established.

In its quality policy the INSTAT commits itself to quality:

- it undertakes to familiarize itself with user needs,
- it measures and evaluates product and process quality and, on this basis, develops them continuously,

An organizational structure and tools supporting quality management must be used. There must be an organizational unit or person responsible for quality.

- ✓ it integrates international standards and recommendations as well as good practices,
- ✓ efforts should be made to mitigate burden on data providers,
- ✓ it helps promoting a culture committed to quality,
- ✓ it provides appropriate training for staff members.

Quality policy is available at the website of the INSTAT.

The person or, ideally, the organizational unit deals with quality management in a dedicated way, thus a sharper focus is placed on quality management and as a result, its implementation stands a better chance. The responsibilities of this organizational unit or person are the maintenance, operation, improvement of the quality management system, the maintenance and development of tools (expectations - e.g. quality guidelines, measurements, documentation, evaluation and improvement), the promoting of quality focus across the organization, communication of the tools, control the compliance of the requirements, initiating organizational development and holding quality courses on educating quality management system(e.g. INSTAT School).

The quality management system is regularly revised and improved.

Institute level quality requirements must be revised regularly. Responsibility for the maintenance of the recommended INSTAT level quality measurement tools and the system lies with the Methodological and IT Board. Upon its request, experts (usually, the staff members of the Methodology Department, process phase co-coordinators and horizontal organizational units) put forward proposals. The Board evaluates and submits it to the General Director of the INSTAT. Responsibility for the use of the tools lies with subject-matter areas. Responsibility for the subject-matter domain-level maintenance and development of requirements and special measurement tools lies with the subject-matter areas.

An example of the audits required and operated by EUROSTAT is self-assessment and peer review linked to the Code of Practice. If the system in use in INSTAT is compatible, that helps the implementation and effectiveness of EU inspections (audits).

The quality management system should also cover the Other National Agencies (ONAs).

Product quality is regularly monitored, assessed with regard to possible trade-offs between product quality components. Product quality is reported according to the quality criteria for European Statistics.

Keep contact regularly with ONAs. The national statistical system must be co-ordinate in order that we can assure and improve the quality of the official statistics produced by the various organizations (tools: law, standards and guidelines, communication, training, involvement in audits).

The quality of the various groups of statistical products must be analyzed comprehensively and, if necessary, actions must be taken. Fact-based analyses (quality indicators, quality reports and audit reports) help detect the problems that emerge at a number of areas and identify the areas to be improves and priorities to set. Analyses help measure the impact of improvements on product quality.

The system of quality reports must be regulated furthermore quality reports should be utilized in respect of improvement actions.

There are procedures in place to plan and monitor the quality of the statistical production process. In order to ensure process quality, process phase co-coordinators need to be designated.

Such procedures are, for instance, process quality indicators, methodologies, technical support provided by IT systems (workflow system or the automatic indicator calculating function of IT systems), protocols (e.g. detailed survey design), and quality assurance plan.

Process phase co-coordinators (a person, a group or an organizational unit) - if there are no such coordinators, efforts should be made to have them in place - monitor and analyses processes from the perspective of compliance with the quality expectations, document and monitor process variables. If they detect any problem, they notify the person in charge of surveys.

Process phase coordinators can monitor trends in standard process variables typical of a specific process phase in respect of ALL products going through in the standard process phases, therefore, they can make comparisons and perform evaluations in time and in a cross-sectional manner and can initiate well-established modifications and improvements.

Process quality assurance should be realized already during the data production process, during the realization of sub-process phases.

In the name of process quality assurance, in the course of data production process participants and those responsible for surveys monitor the quality of process phases and assess if activities have been performed in line with the requirements. Thus, those concerned should be familiar with quality requirements for the specific process and sub-process phases and monitor the values of the process variables reflecting them (e.g. number of incoming questionnaires filled in with data).If variables are still below the required value, if possible, they intervene in the process (e.g. with urging).If it is no longer possible, participants in the process must be warned or, based on the information available, the responsible person will decide on the next step in processing and, if necessary, modify processing (e.g. more imputing).

We must apply available tools and methods supporting quality management consciously.

With the application of right tools efficiency, speed and effectiveness can be increased. Such tools include e.g. the assessment of user needs, process modelling, workflow systems, measuring tools (e.g. fishbone diagrams, Pareto diagrams, flow charts), tools used for problem solving (e.g. brainstorming, tree diagrams), improvement plans (e.g. Gantt diagrams, project planning methods), process controlling methods (e.g. control cards and Balanced Scorecard).

Quality Dimension

- ✓ Quality commitment
- ✓ Managing respondent burden

Possible quality indicators

- ✓ Availability of a quality assurance plan, or any other similar scheme, describes the working standards, the formal obligations (such as laws and internal rules) and the set of quality control actions to prevent and monitor errors, to evaluate quality indicators and to control different points at each stage of the statistical process.(This indicator is valid for the institutional level.)
- ✓ Availability of a quality policy and its availability on the web site
- ✓ A Quality Commitment Statement is made publicly available, laying out principles and commitments related to quality in statistics which are consistent with the goals set out in the mission and vision statements. (This indicator is valid for the institutional level.)
- ✓ Availability of procedures to plan and monitor the quality of the statistical production process.
- ✓ Availability of a clear organizational structure for managing quality within the statistical authority.

Examples of such a structure are:
- Quality Committee;
- Quality Manager;
- Centralized Quality unit;
- Other structures (e.g. a selected group of staff trained as "quality pilots" to act as project/processes coach/advisers).

- ✓ For what proportion of GSBPM sub processes are standardized corporate solutions used?
- ✓ Is a process of risk identification and management in place? (Yes/No) Time since risk management plans were last reviewed? (Years and Months)
- ✓ Extent of HR requirements fulfilled (e.g. training, staffing)
- ✓ Extent to which quality indicators, metadata and para-data are compliant to standards
- ✓ Is there a communication strategy encouraging response by informing potential respondents about the survey?
- ✓ Percentage of statistics produced from administrative data and other data sources instead of survey (Covers all statistical domains)

METADATA MANAGEMENT

Good metadata management is essential for the efficient operation of statistical business processes. Metadata are present in every phase, either created or carried forward from a previous phase. In the context of this model, the emphasis of the over-arching process of metadata management is on the creation, use and archiving of statistical metadata, though metadata on the different sub-processes themselves are also of interest, including as an input for quality management. The key challenge is to ensure that these metadata are captured as early as possible, and stored and transferred from phase to phase alongside the data they refer to. Metadata management strategy and systems are therefore vital to the operation of this model, and these can be facilitated by the GSIM.

The GSIM is a reference framework of information objects, which enables generic descriptions of the definition, management and use of data and metadata throughout the statistical production process. The GSIM supports a consistent approach to metadata, facilitating the primary role for metadata, that is, that metadata should uniquely and formally define the content and links between information objects and processes in the statistical information system.

Metadata Handling

i. ***Statistical Business Process Model:*** Manage metadata with a focus on the overall statistical business process model;
ii. ***Active not passive:*** Make metadata active to the greatest extent possible. Active metadata are metadata that drive other processes and actions. Treating metadata this way will ensure they are accurate and up-to-date;
iii. ***Reuse:*** Reuse metadata where possible for statistical integration as well as efficiency reasons;
iv. ***Versions:*** Preserve history (old versions) of metadata.

Metadata Authority

i. ***Registration:*** Ensure the registration process (workflow) associated with each metadata element is well documented so there is clear identification of ownership, approval status, date of operation, etc.
ii. ***Single source:*** Ensure that a single, authoritative source ('registration authority') for each metadata element exists.
iii. ***One entry/update:*** Minimize errors by entering once and updating in one place.
iv. ***Standards variations:*** Ensure that variations from standards are tightly managed/approved, documented and visible.

Relationship to Statistical Cycle / Processes

i. ***Integrity:*** Make metadata-related work an integral part of business processes across the organization.
ii. ***Matching metadata:*** Ensure that metadata presented to the end-users match the metadata that drove the business process or were created during the process.
iii. ***Describe flow:*** Describe metadata flow with the statistical and business processes (alongside the data flow and business logic).
iv. ***Capture at source:*** Capture metadata at their source, preferably automatically as a by-product of other processes.
v. ***Exchange and use:*** Exchange metadata and use them for informing both computer based processes and human interpretation. The infrastructure for exchange of data and associated metadata should be based on loosely coupled components, with a choice of standard exchange languages, such as XML.

Users

i. ***Identify users:*** Ensure that users are clearly identified for all metadata processes, and that all metadata capturing will create value for them.
ii. ***Different formats:*** The diversity of metadata is recognized and there are different views corresponding to the different uses of the data. Different users require different levels of detail. Metadata appear in different formats depending on the processes and goals for which they are produced and used.
iii. ***Availability:*** Ensure that metadata are readily available and useable in the context of the users' information needs (whether an internal or external user).

Quality Dimension

- ✓ Managing metadata

Quality indicators

- ✓ Availability of a policy on metadata documentation and standards on updating metadata. The policy is communicated to internal users and accessible on the web site.
- ✓ Performance indicators for the accuracy, completeness, timeliness and accessibility of disseminated metadata at the institutional level, assessed annually against predetermined targets.
- ✓ Quality of the metadata can be assessed for each statistical programme and then rolled up to higher levels of institutional units
- ✓ Extent to which metadata and metadata terminology are compliant to existing metadata standards. *(Metadata standards include GSIM, GSBPM, CSPA and LIM)*
- ✓ Extent to which the life cycle of the metadata is managed across the GSBPM.
- ✓ Use of a metadata system (data or process metadata) in the production process. (Yes / No)
- ✓ Extent to which metadata are adequately stored and archived using a metadata model (easily retrievable; properly labelled; retention period indicated)
- ✓ Extent to which metadata are accurately and completely registered in a corporate metadata repository/registry.
- ✓ The importance of a metadata model and data metadata stored in a metadata system is crucial in processing and delivering data.
- ✓ The maintenance of the production process is easier when it uses information from general metadata systems and information is not coded in production programs.
- ✓ Extent to which metadata are available in different formats and available to internal and external users
- ✓ Are metadata available in machine-readable, searchable and accessible formats?
- ✓ Are metadata available in open data portals?
- ✓ Are metadata and data accessible in standard exchange formats such as SDMX, DDI or XBRL?

DATA MANAGEMENT

Data management is essential as data are produced within many of the activities in the statistical business process and are the key outputs. The main goal of data management is to ensure that data are appropriately used and usable throughout their lifecycle. Managing data throughout their lifecycle covers activities such as planning and evaluation of data management processes as well as establishing and implementing processes related to collection, organisation, use, protection, preservation and disposal of the data.

How data are managed will be closely linked to the use of the data, which in turn is linked to the statistical business process where the data are created. Both data and the processes in which they are created must be well defined in order to ensure proper data management.

Examples of data management activities include:

- Establishing a governance structure and assigning data stewardship responsibilities;
- Designing data structures and associated data sets, and the flow of data through the statistical business process;
- Identifying database (repositories) to store the data and administration of the database;

- Documenting the data (e.g. registering and inventorying data, classifying data according to content, retention or other required classification);
- Determining retention periods of data;
- Securing data against unauthorised access and use;
- Safeguarding data against technological change, physical media degradation, data corruption;
- Performing data integrity checks (e.g. periodic checks providing assurance about the accuracy and consistency of data over its entire lifecycle);
- Performing disposition activities once the retention period of the data is expired.

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